

REACTIONS TO LAPSES IN EXERCISE THERAPY:  
A SELF-REGULATORY PERSPECTIVE

A Thesis Submitted to the College of  
Graduate Studies and Research  
In Partial Fulfillment of the Requirements  
For the Degree of Master of Science  
In the College of Kinesiology  
University of Saskatchewan  
Saskatoon

By

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Keywords: exercise therapy, cardiac rehabilitation, lapse, negative affect, negative  
thoughts, self-regulatory efficacy

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## ABSTRACT

The self-regulation of exercise for the purposes of disease prevention and rehabilitation is a complex process that includes temporary lapses from exercise adherence. Research is lacking in the understanding of the cognitive experiences associated with lapsing and the impact of possible negative thoughts, emotions, and self-evaluations on future exercise self-regulation. Using a Social Cognitive Theory (SCT) framework, the primary purpose of the present experimental study was to examine the impact of potential negative reactions to exercise lapse experiences on exercise self-regulatory cognitions (i.e., decisional struggle, exercise self-regulatory efficacy, action planning, and willingness to self-regulate) using an experimental message designed to induce negative thoughts and affect about exercise lapsing. A secondary purpose of the study was to examine the potential moderating influences of the relatively unexplored construct of emotional self-efficacy on possible negative reactions. Forty-four adult participants were recruited from two exercise therapy programs run by the local health region to participate in this study. Participants filled out baseline measures of demographics, exercise self-regulatory efficacy (exercise SRE), and emotional self-efficacy at the first meeting. At the second meeting, participants were randomly assigned to read either an information control message or a negative lapse message. After reading the message, participants responded to affect measures and recorded their acute exercise thoughts. Next, self-regulatory cognitions were measured including decisional struggle, exercise SRE, action planning, and willingness to self-regulate. There were no significant differences between experimental groups on any of the measures,  $F(9, 34) = .80$ , Wilks'  $\lambda = .825$ ,  $p = .619$ . Possible explanations for these nonsignificant results are discussed.

Given the opportunity to compare the present results to past research on acute positive and negative exercise thoughts by Gyurcsik and colleagues, and to potentially extend these findings to a population of exercise therapy maintainers, post hoc analysis of related research questions was carried out. Groups of positive and negative thinkers were formed based on the measure of acute thoughts. The omnibus MANOVA comparing positive and negative thinkers on social-cognitive measures was significant,  $F(8, 31) = 2.72$ , Wilks'  $\lambda = .588$ ,  $p = .021$ . As hypothesized, positive thinkers were found to have higher positive affect ( $p = .03$ ), lower decisional struggle ( $p = .006$ ), higher exercise SRE ( $p = .013$ ), and higher willingness to self-regulate ( $p = .003$ ). Positive thinkers also exercised more frequently than negative thinkers both at the program,  $F(1, 36) = 9.5$ ,  $p = .004$ , and independently,  $F(1, 36) = 5.4$ ,  $p = .026$ . Results are discussed in relation to SCT and past research on acute exercise thoughts. Limitations of the original experiment are discussed in terms of the negative lapse message. Future research is discussed both for the study of negative reactions to lapsing and for positive and negative thinking related to exercise.

## ACKNOWLEDGMENTS

This research was made possible with the help of many people. My supervisor, Dr. Larry Brawley, has been a wonderful mentor throughout my time in graduate school. I greatly appreciate his patience and his desire and willingness to teach, guide, and collaborate (and his willingness to offer the occasional “atta-girl”...or not just an “atta-girl”, to be accurate). Dr. Brawley has given me many research opportunities and taught me many important things, such as how to think from a “top-down” perspective. He has also succeeded at making all of this an enjoyable experience, for which I am grateful.

I would like to thank my committee members, Dr. Nancy Gyurcsik, Dr. Kevin Spink, and Dr. Donna Goodridge for their thoughtful input and the time they dedicated to helping with this project.

I am grateful for the funding I have received from the College of Graduate Studies and Research and the Social Sciences and Humanities Research Council.

The support offered along the way from my family and friends, and the contributions (including friendship) from fellow graduate students, are most appreciated. The collaboration and camaraderie with fellow “Larry Lab” members has been especially important to me.

Finally, I would like to acknowledge the assistance of Mr. Rick Stene, Director of Saskatoon Health Region Chronic Disease Management Programs-Exercise, as well as the participants for offering their time and interest.

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## LIST OF ABBREVIATIONS

SCT = Social Cognitive Theory

EMSE = Emotional self-efficacy

Exercise SRE = Exercise Self-Regulatory Efficacy

PANAS = Positive and Negative Affect Scales

MBM = Mood Behavior Model

RPM = Relapse Prevention Model

## Introduction

### *Adherence to Exercise for Chronic Disease Management*

Lifestyle-related morbidities, such as cardiovascular disease, diabetes, and obesity, are problematic in our modern society. Cardiovascular disease remains the leading cause of death in both Canada and the United States (Centers for Disease Control (CDC), 2002; Statistics Canada, 2008). Approximately 1.3 million Canadian adults in 2005 had diabetes (Statistics Canada, 2007), and in 2004, 36% of Canadian adults were overweight, and 23% were obese (Statistics Canada, 2004). Exercise is often recommended as a means for both prevention and rehabilitation of these health conditions. The benefits of structured exercise programs are well documented, as in the case of rehabilitation from cardiovascular disease and other chronic diseases (Nelson et al., 2007). These benefits include improved physical function, mental health, and quality of life outcomes (American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR), 1999). However, in order to gain the health promoting and disease preventive benefits from exercise, long-term adherence is necessary (Rothman, 2000).

### *Lapses in Long-Term Adherence*

Long-term adherence to an exercise program is complicated, but of great importance to people with heart disease, diabetes, and risk factors for these diseases. Despite the importance of exercise for these populations, many people fail to maintain their intended exercise behaviour. Of people who begin an exercise program, including patients in cardiac rehabilitation exercise programs, between 25-50% drop out within six months (Burke, Dunbar-Jacob, & Hill, 1997; Dishman, 1994). Early research in the area of exercise adherence focused on predicting adherence to exercise programs based on

descriptive, atheoretical factors, such as personal characteristics and environmental factors (Dishman, 1988, 1994). Although that research recognized the *existence* of lapses in adherence to health behaviours, such as exercise, there currently remains a lack of research on the acute *experience and consequences* of lapses (De Ridder & De Wit 2006; Rothman, 2000; Stetson et al., 2005). Lapses from exercise adherence are considered short interruptions from regular exercise, such as one to two weeks of inactivity (Conroy et al., 2007; Sallis et al., 1990; Simkin & Gross, 1994). Relapses occur when exercise is not resumed after a lapse and inactivity ensues for a longer period of time, such as three months (Conroy et al., 2007; Simkin & Gross, 1994).

Although some adherence-related models consider relapse, there is relatively little investigation of the psychological aspects of lapses, which can be the precursor to complete relapse. Whereas, for example, the transtheoretical model of behaviour change (Prochaska, DiClemente, & Norcross, 1992) distinguishes people in the adoption, maintenance, and relapse stages of exercise based on arbitrary distinctions of time, the model cannot predict the psychological conditions that lead to relapse (Rothman, 2000). Along these lines, researchers have recently noted that there is a need to understand the *psychological processes* people experience day-to-day as they deal with the frustrations of adhering to the maintenance of health behaviours, such as exercise, and to understand the processes that lead from lapse to relapse (De Ridder & De Wit, 2006; Leventhal & Mora, 2005; Rothman, 2000; Wing, 2000).

Lapses in exercise occur for many different reasons and are part of the long-term self-regulation of behaviour, which for most people is a dynamic process of adherence, lapses, relapses, and recovery from relapse after varying lengths of time (Sallis et al.,

1990). Bad weather, lack of interest, lack of time, work and family demands, injuries, and personal stress are all common reasons given for exercise lapses (Sallis et al., 1997). Not only do these lapses contribute to a decreased amount of exercise participation over time, they may also set the stage for stopping exercise all together. Understanding how individuals react to a temporary lapse is crucial to determining whether it escalates into total relapse (Meichenbaum & Turk, 1987). For example, an individual may lapse initially because of an illness or injury, or because they are on vacation, but after struggling to overcome the challenges of restarting their exercise routine, they relapse. Despite the research that has identified a number of these potential reasons for lapse and relapse, the psychological processes surrounding these times of lapse are not well researched.

To help address this need, several areas of research on self-regulation point to negative moods, emotions, and thoughts as precipitating factors to self-regulatory disruption and potential failures, such as exercise lapses (Barone, Maddux, & Snyder, 1997; Baumeister, 1997; Kirschenbaum, 1987). Collectively, this research suggests that feeling and thinking negatively after an initial failure experience may interfere with future successful self-regulation, leading to a cumulative effect of successive lapses and, potentially, nonadherence.

### *Social-Cognitive Processes and Exercise Adherence*

To successfully change behaviour, models that not only predict behaviour, but also offer guidance on how to change behaviour are needed (Bandura, 2005). Ideally such models, especially in the exercise domain, would help to explain what happens at a time of failure in the behaviour change process. As well, if the understanding offered by such

models about the experience of lapses is lacking, we are unable to intervene. Therefore, this type of research is important in order to shed light on the social-cognitive processes of *how* individuals who react negatively to an exercise lapse situation may be hindered in their future attempts to resume exercise. Such information might lead to the development of interventions to help individuals successfully navigate temporary lapses in adherence to exercise therapy and potentially target inadequate self-regulatory skills and detrimental beliefs and reactions.

In order to understand the possible social-cognitive impact of lapses on future attempts at self-regulation, and to provide background for an investigation about lapses, the following topics are informative: (a) an understanding of social cognitive theory (SCT), self-efficacy, and self-regulation as related to exercise adherence; (b) consideration of the interaction between thoughts, emotions, and self-regulation, in order to understand why lapses occur and why they may be detrimental; (c) the potential impact of negative reactions on self-regulatory processes of self-regulatory efficacy, decisional struggle, action planning, and willingness to self-regulate; (d) consideration of how emotional self-efficacy may play a role; and finally, (e) a brief synopsis of the related research that has been done on exercise lapses.

#### *Social Cognitive Theory (SCT), Self-Efficacy, and Self-Regulation*

The backdrop for this study is SCT (Bandura, 1986, 1997). Broadly, SCT proposes that behaviour, the environment, and characteristics of the person (cognitive, affective, and biological) all influence each other reciprocally to determine an outcome (Bandura, 1986). Self-efficacy, the context-specific confidence individuals have in their abilities to successfully carry out specific actions, figures prominently in SCT and in

predicting or changing behaviour (Bandura, 1986, 1997). SCT also has a prominent self-regulatory focus and suggests various ways in which individuals' beliefs about their skills and abilities to manage their behaviour might be altered by past experiences. This mastery information may influence self-efficacy either negatively, as in the case of a lapse, or positively, as in overcoming a lapse (Bandura, 1986, 1997; Maddux & Lewis, 1995). The hypotheses for this study follow SCT tenets and research, while being additionally supported by other theories and models used in behaviour change research.

*Self-regulation.* Self-regulation concerns how we regulate our behaviour, thoughts, and emotions in order to pursue goals, such as adhering to exercise for chronic disease management (Baumeister & Vohs, 2003). In general, self-regulation involves the presence of a goal, the process of self-monitoring in pursuit of that goal, self-evaluative reactions to success and failure, and the influence of self-efficacy beliefs on these processes (Bandura, 1997; Barone, Maddux, & Snyder, 1997; Baumeister & Vohs, 2003).

Since evaluating one's progress towards goals is part of self-regulation, one might speculate that falling short of goals would motivate a person to try harder. However, this seems to be true only in the case of simple tasks (Barone et al., 1997; Cervone, Jiwani, & Wood, 1991; Cervone & Wood, 1995). The process of self-regulation during complex tasks and the impact of self-evaluative reactions are not well-researched areas (Barone et al., 1997). Complex tasks, such as managing exercise, require self-regulation of multiple behaviours. Being dissatisfied with performance on these tasks may cause individuals to dwell on their failures and inadequacies and draw attention away from the task at hand (Barone et al., 1997). These negative reactions will be discussed in more detail in the next section.



*Self-efficacy and self-regulation.* Having strong self-efficacy beliefs is important for all aspects of self-regulation (cf. Bandura, 1997, 2005). Self-efficacy beliefs influence the goals people choose, the effort and persistence they apply to the activities involved in goal pursuit, and how they deal with challenges and obstacles (Bandura, 1997; Barone et al., 1997; Maddux & Gosselin, 2003). Overall, self-efficacy influences what activities people choose to undertake, as people generally avoid situations where they do not expect to do well (Bandura, 1997; Barone et al., 1997). With regard to the self-regulation of exercise, the influence of self-efficacy on all of these aspects of self-regulation is important.

*Self-efficacy, self-regulation, and negative information.* Self-regulatory efficacy is the critical efficacy belief that influences the self-management of goals (Bandura, 1997, 2005). From the SCT perspective, not succeeding at personal goals is a negative source of self-efficacy information (cf. Bandura, 1997). This negative information is theorized to reduce the self-regulatory efficacy necessary for adherence to a complicated behaviour, such as exercise. Therefore, decreases in efficacy as a result of negative reactions to perceived failure experiences (e.g., lapses) need to be understood in terms of their impact on the self-regulatory actions necessary to reach exercise goals.

Several studies provide data to support the notion that exercise lapses are viewed as negative experiences and are related to lower self-efficacy. For example, in a sample of three hundred overweight post-menopausal women, 61% reported an exercise lapse in the past six months. These women also reported feelings of guilt and decreased self-efficacy (Conroy, Simkin-Silverman, Pettee, Hess, Kuller, & Kriska, 2007). Furthermore, of those women who lapsed initially, 39% failed to return to exercise. This latter finding

was related to higher levels of stress and depressive symptoms (Conroy et al., 2007). Other studies also point to lapses being associated with negatively oriented reactions. In a sample of adults with type 2 diabetes, failure to adhere to prescribed exercise led to decreased self-efficacy, which in turn, was related to depression outcomes (Sacco, Wells, Vaughan, Friedman, Perez & Matthew, 2005). Finally, a prospective study in exercising women found that after missing exercise and not meeting their weekly exercise goals, the women perceived high stress and had lower efficacy for meeting their upcoming exercise goals (Stetson, Rahn, Dubbert, & Mercury, 1997). These findings lend support to the notion that lapses, cognitive reactions to lapses, and relapse are part of an ongoing cyclical process, and that lowered efficacy is related to this process. Together, these empirical studies help to give support for applying SCT predictions to the influence of negative reactions on self-efficacy in the exercise lapse context.

Shields, Brawley, and Lindover (2005) took a unique approach to examining failure experiences by looking at social-cognitive differences in exercise program participants who perceived either success or failure at program adherence. Even when the perception of failure or success by the participants did not match investigator-defined categories of adherers and dropouts, the impact of the perception of failure on social cognitions was noteworthy. Specifically, those who perceived themselves as failing had lower positive affect and self-efficacy. The results of this study also support notions that perceptions and reactions to lapses are relevant to self-efficacy.

The ways in which self-regulatory efficacy is important to self-regulation, and how failing to self-regulate may interfere with this self-regulatory efficacy, are apparent from the above examples. To further our understanding of the dilemma of exercise

lapses, a discussion follows of the common problem of self-regulation failure, and how negative thoughts and emotions in general, or resulting from a lapse, may impact the self-regulation process.

### *Negative Thoughts and Emotions and Self-Regulation*

Given that self-regulation is a complex and challenging process at which people are often unsuccessful, it is useful to consider how negative thoughts, moods, and emotions play a role in the self-regulation process. Furthermore, recall that part of the process of self-regulation involves self-evaluation of progress. Thus, it is useful to consider how instances of self-regulation failure may lead to the negative moods and emotions.

*Relevant evidence from SCT based research.* As SCT is a guiding framework for the theoretical understanding and measurement strategies for this study, it is important to highlight the ways in which SCT suggests how negative thoughts and emotions, from failure or other experiences, may influence self-regulation. Previous research in this area points to several important pathways of influence that may result from both negative self-reactions and negative states in general. Whereas the previous section of the introduction highlighted the impact of failure experiences on the essential efficacy needed for self-regulation, it may also be argued that this efficacy is influenced by general negative thoughts and affect (SCT: Bandura, 1997; Gyurcsik & Brawley, 2000; Kavanagh & Bower, 1985). In addition, SCT research shows that cognitive decision-making is disrupted when people make negative self-evaluations of performance during the process of self-regulation (Barone et al., 1997; Maddux & Lewis, 1995).

There has been ample research based upon SCT that addresses the link between emotions, cognitive rumination, and behaviour. Social cognitive research in the exercise domain by Gyurcsik and colleagues has examined acute negative and positive thinking and the relationship to exercise consistency, efficacy, and struggle about exercise decisions among exerciser maintainers (Gyurcsik & Brawley, 2000, 2001; Gyurcsik et al., 2002; Gyurcsik & Estabrooks, 2004). Negative exercise thoughts were associated with greater decisional struggle about exercise, lower self-regulatory efficacy for scheduling exercise, as well as individuals' level of consistency with exercise adherence (Gyurcsik & Brawley, 2000, 2001). This research encompassed aspects of negative thinking as well as cognitive rumination associated with the struggle in making exercise decisions. Both variables were related to self-regulatory efficacy.

The mechanism that may be associated with the negative thoughts and emotions and lower self-efficacy that are linked to the inability to adapt to situations requiring self-regulation has been suggested by Maddux and Lewis (1995). In these situations, for those with lower efficacy, there is a tendency to remain self-diagnostic as opposed to being task-diagnostic for the purpose of solving a problem. Being self-diagnostic means effort is spent dwelling on personal inadequacies thereby diminishing the effort being put forth to solve a problem (Maddux & Lewis, 1995). This was exemplified in a study of complex decision-making tasks, in which researchers found that dissatisfaction with one's performance caused participants to apply more decisional effort. However, these participants adopted poorer strategies and produced poorer results leading the investigators to suggest that negative affect and self-preoccupations led to ruminations

about capabilities that interfered with performance on the decision-making tasks (Cervone, Jiwani, & Wood, 1991).

A few studies have looked at the impact of mood (in the absence of performance feedback) on self-efficacy (Maddux & Meier, 1995). One such study by Kavanagh and Bower (1985) showed that inducing a happy, versus a sad or neutral mood, increased self-efficacy for a range of interpersonal and athletic behaviours. The authors suggested that the relationship between mood and self-efficacy might be explained through the recall of mood-congruent memories of success (Kavanagh & Bower, 1985). Another study by Salovey and Birnbaum (1989) also used a protocol that induced happy, neutral, or sad moods and tested the effects on health beliefs in healthy and ill people. Ill individuals, who underwent the sad mood induction, reported lower self-efficacy for carrying out illness-alleviating and health-promoting behaviours, as compared to their happy or neutral mood counterparts. These studies provide some evidence that suggests that a general negative mood may possibly be detrimental to the efficacy that is needed for self-regulation.

*Relevant evidence from other self-regulation research.* Social cognitive theory research is not alone in relating negative states with ineffective self-regulation. Much evidence exists that negative emotional states and emotional distress are precipitating factors to self-regulatory failure that impair the self-regulation process (Baumeister, 1997; Kirschenbaum, 1987; Marlatt & Gordon, 1985). The source of the distress may come from many sources, including not reaching the goal one is trying to achieve (e.g., exercising).

Self-regulation research by Baumeister and colleagues proposes several mechanisms to explain the detrimental effects of negative emotions on self-regulation (cf. Baumeister, Zell, & Tice, 2007). First, undergoing emotional distress tends to lead people to seek immediate comfort and in the process of seeking good feelings, the effort towards the goal of self-regulation is hampered. Second, poor decision-making often ensues as a result of negative emotions and people fail to think through the consequences and possible outcomes of their actions. Third, negative emotions that are linked to feeling bad about oneself may lead to avoiding self-awareness, thus compromising self-monitoring needed for effective self-regulation (Baumeister et al., 2007).

Further agreement about possible mechanisms comes from earlier research. In a review of self-regulation failure during the complex long-term process of self-management of behaviour, Kirschenbaum (1987) proposes eight components of self-regulatory failure, which include difficulty dealing with emotional stressors, an initial relapse episode, and problems with focus of attention. In some cases, the culprit for self-regulation failure is the negative reaction to an initial lapse or failure experience (Kirschenbaum, 1987). The underlying theme in all of these causes of self-regulation failure, according to Kirschenbaum, is disengagement from self-monitoring.

Poor self-regulation is linked with negative moods by research on the mood-behavior-model (MBM: Gendolla, 2000; Gendolla & Brinkmann, 2005). The MBM proposes that moods affect self-regulation processes in two important ways. People in a negative mood state appraise tasks as more demanding (i.e., they judge a task as more difficult), see their ability as lower, the effort needed as greater, and the likelihood of success as lower. These judgments then influence the intensity of effort and persistence

people apply to their behaviour (cf. Gendolla & Brinkmann, 2005). These proposals are similar to those advanced by SCT where the construct of self-efficacy influences one's choice of activity, effort expenditure, and persistence in the face of adversity (Bandura, 1997).

Regardless of the theoretical perspective guiding the research, the aforementioned literature, when considered together, emphasizes that negative emotions are an important antecedent to lapses in self-regulation. It also reveals that negative self-evaluations, decreases in efficacy, and cognitive ruminations following an initial failure may complicate situations demanding self-regulation and lead to relapse. Therefore, negative reactions to exercise self-regulation failure (i.e., lapses) need to be understood in terms of their impact on the self-regulatory processes necessary to reach exercise goals in the future.

#### *Potential Impact of Negative Reactions on Exercise Self-Regulatory Cognitions*

The evidence presented thus far gives support to the idea that self-regulating exercise maintenance behaviour is a complex process even further complicated by negative emotions, self-evaluations, and initial failure experiences. However, what self-regulatory cognitions in particular can we expect to be affected when people react negatively in lapse situations?

In the current study, the interest concerns the impact of individuals' negative reactions (affect and thoughts) on their (a) self-regulatory efficacy, (b) decisional struggle about exercise, (c) ability to make an action plan for exercise under challenging circumstances, and (d) willingness to self-regulate when facing a lapse under challenging circumstances. Together, these four variables represent several manifestations of the

reaction to a lapse. The roles of action planning ability and willingness are described below.

*Action planning ability.* Making action plans is a self-regulatory skill shown to be important to exercise adherence in both healthy individuals and in cardiac rehabilitation exercisers (Luszczynska, 2006; Sniehotta, Scholz, & Schwarzer, 2006). Action plans are plans about how, where, and when to perform a behaviour. Considering the evidence of decreased self-monitoring, cognitive ineffectiveness, and decreased problem-solving ability due to negative self-evaluations (Baumeister et al., 2007; Maddux & Lewis, 1995), it seems logical to consider the additional impact of cognitive ruminations on people's abilities to make action plans under challenging circumstances, such as a change of normal routine.

*Willingness to self-regulate in the face of challenging circumstances.* When faced with a challenging situation, such as a lapse, dealing actively with the situation should prove beneficial for maintaining effective self-regulation (De Ridder & De Wit, 2006; Kirchenbaum, 1987; Salovey, Stroud, Woolery, & Epel, 2002; Stetson et al., 2005). SCT suggests that those whose self-efficacy is reduced by feeling badly about lapsing (i.e., negative thoughts and emotions) will be less likely to choose difficult activities, such as self-regulating their own exercise and actively handling the problem. These people would also be more likely to choose non-action, as they feel they are incapable of meeting the challenges associated with a lapse and are ineffective at problem solving (cf. Maddux & Gosselin, 2003). In contrast, those who remain positive are more likely to be adaptive in their actions when presented with challenging situations and more likely to persist with difficult behaviours (Maddux & Gosselin, 2003; Peterson, 2000). Therefore, the current



study will examine the degree to which people are willing to self-regulate by doing certain actions in the face of a lapse, such as seeking out alternatives and advice from others.

*Potential Moderator of Negative Reactions: Emotional Self-Efficacy (EMSE)*

According to SCT, affect is influenced by self-efficacy beliefs, and reciprocally, affect is a source of self-efficacy information (Bandura, 1997). Confidence to control one's thoughts, moods, and emotions in specific circumstances, known as emotional self-efficacy (i.e., EMSE), is a relatively unexplored SCT construct (Maddux & Lewis, 1995; Muris, 2002). Emotional self-efficacy is important to adaptive behaviour because low emotional self-efficacy leads to recurrent negative rumination that is likely to lead to further emotional distress and feelings of inefficacy (Maddux & Lewis, 1995). Just as a sense of efficacy regarding self-regulation of behaviour is important and adaptive, having a sense of control over one's thoughts and feelings is also important for psychological health and adjustment (Maddux & Gosselin, 2003).

The concept of EMSE has been identified as an important area for research, but to date has only been studied in a few cases, and to our knowledge, not in the exercise domain (Maddux & Lewis, 1995). Related research on EMSE in children and adolescents has found that low efficacy is related to high levels of anxiety and depression (Muris, 2002). Considering that negative emotions and ruminations have a detrimental impact on successful self-regulation of behaviour, confidence in one's ability to regulate emotions and prevent further emotional distress warrants examination.

The role played by emotional self-efficacy in the impact of negative reactions on social cognitions associated with a lapse may be a one of moderation. For example, the

impact of negative thoughts and emotions due to an exercise lapse may be moderated, such that those with high EMSE are able to remain confident, in control, and focused on problem solving, while those with low EMSE dwell on the negative emotions and self-evaluations, and are unable to solve problems. If people lose confidence in their abilities and expect to keep feeling bad about their perceived failure, this may confound their efforts to resume exercising. Thus, lapsing, inaction, and negative rumination might continue without the ability to cope with negative feelings after a lapse.

#### *Related Research on Exercise Lapses*

As noted earlier, the study of lapsing in the exercise literature is quite limited, and often focused on correlates of adherence and dropout (e.g., Transtheoretical Model: Prochaska et al., 1992). Research concerning the acute or immediate period of time surrounding a lapse, and the ensuing resumption of activity or relapse, is minimal with only a few studies (Dishman, 1994; Rothman, 2000). Recall that several studies have looked at self-efficacy following an exercise lapse and found support that self-efficacy may decrease after a lapse leading to an ongoing process of lapsing (Conroy et al., 2007; Sacco et al., 2005; Stetson et al., 1997).

A few studies on exercise lapsing have emerged using a model that was imported from the addiction and diet literature. This perspective is Marlatt and Gordon's (1985) Relapse Prevention Model (RPM). The RPM is a conceptual model that identifies high-risk situations and describes how relapse is likely to occur when people do not have adequate coping skills for these high-risk situations. Application of this model is often focused on teaching relapse prevention skills. When relapse does occur, the concept of the "abstinence-violation-effect" is described in the model. This is where an initial lapse

leads to guilt and other negative emotions, self-attribution of failure, loss of feelings of control, and an increased probability of relapse. The notion of the abstinence-violation-effect is comparable with the idea that negative reactions to exercise lapses will interfere with self-regulation. The RPM model also suggests that successful coping with high-risk situations will increase confidence to avoid relapsing in the future. However, the RPM is based on abstinence from addictive behaviours, whereas exercise adherence is a process of adding and increasing behaviour to one's lifestyle. This fundamental difference brings into question whether the RPM is completely applicable to the study of exercise behaviour (Dishman, 1988; Simkin & Gross, 1994; Stetson et al., 2005). Nonetheless, RPM exercise studies provide some additional support for pursuing the investigation of lapses and offer a small amount of research about the experience of exercise lapses specifically.

Two studies focus on exercise lapses, high-risk situations, and coping responses using the RPM. Simkin and Gross (1994) followed women over a 14-week exercise intervention and found that 66% of participants missed a week or more at a time ("a lapse") and 41% missed 3 consecutive weeks ("a relapse"). Prior to the exercise intervention, those who eventually relapsed had significantly fewer behavioural and cognitive coping strategies in response to ten sample high-risk situations for exercise lapse. Thus, relapsing was associated with poorer coping skills.

Stetson et al. (2005) applied the RPM to the prospective study of exercise lapsing in community-based exercise maintainers. Participants were asked to describe a high-risk situation for an exercise lapse that was relevant to them, the cognitive and behavioural coping strategies they would use in high-risk situations, and their reactions to these

situations. The types of coping strategies (i.e., positive/approach or negative/avoidant), and the presence of the abstinence-violation-effect (negative mood, guilt, low perceived control) were associated with patterns of exercise at a three-month follow-up. In support of the RPM, Stetson and colleagues (2005) found that high-risk situations were reported as including negative emotions, and having positive coping strategies reduced the likelihood of exercise lapses in high-risk situations. Also, participants who reported guilt and loss of perceived control following lapses (abstinence-violation-effect) reported shorter exercise durations at the three-month follow-up (Stetson et al., 2005).

#### *Exercise Therapy Context and Sample for the Present Study*

The particular population that was the focus for the current study (i.e., cardiac rehabilitation and First Step participants) might potentially have even greater negative reactions to missing exercise than asymptomatic individuals. Individuals in exercise therapy may react negatively to lapses due to worrying about the deleterious effects on their health. Additionally, individuals learning to exercise in prevention and rehabilitation contexts may also be relatively new to exercise and therefore may not have high levels of efficacy. For such individuals, having modest efficacy beliefs might make it more probable that they would be negatively impacted by a failure event. Therefore, they represent a target population in which negative reactions to a lapse might be more apt to be observed in this exploratory study. They also represent a target population that could benefit if we understood the psychological processes contributing to successive exercise lapses. If these processes are changeable and amenable to intervention, then solutions from intervention studies might be introduced within exercise therapy programs.

## Summary

Literature and theory about self-efficacy and self-regulation, negative thoughts, moods, and emotions and self-regulation, decisional struggle, action planning, willingness to self-regulate, and emotional self-efficacy were examined in order to provide a potential understanding of how these processes are related to cardiac rehabilitation and First Step participants' reactions to lapsing from exercise therapy. Together, both theory and the empirical research cited help to frame objectives for this study. Considering the lack of research in the specific area of psychological processes (e.g., exercise self-regulatory cognitions) and exercise lapses and with reference to acute or immediate negative reactions to lapses, the present study was considered preliminary and exploratory. Figure 1 shows the conceptual framework of the present study.

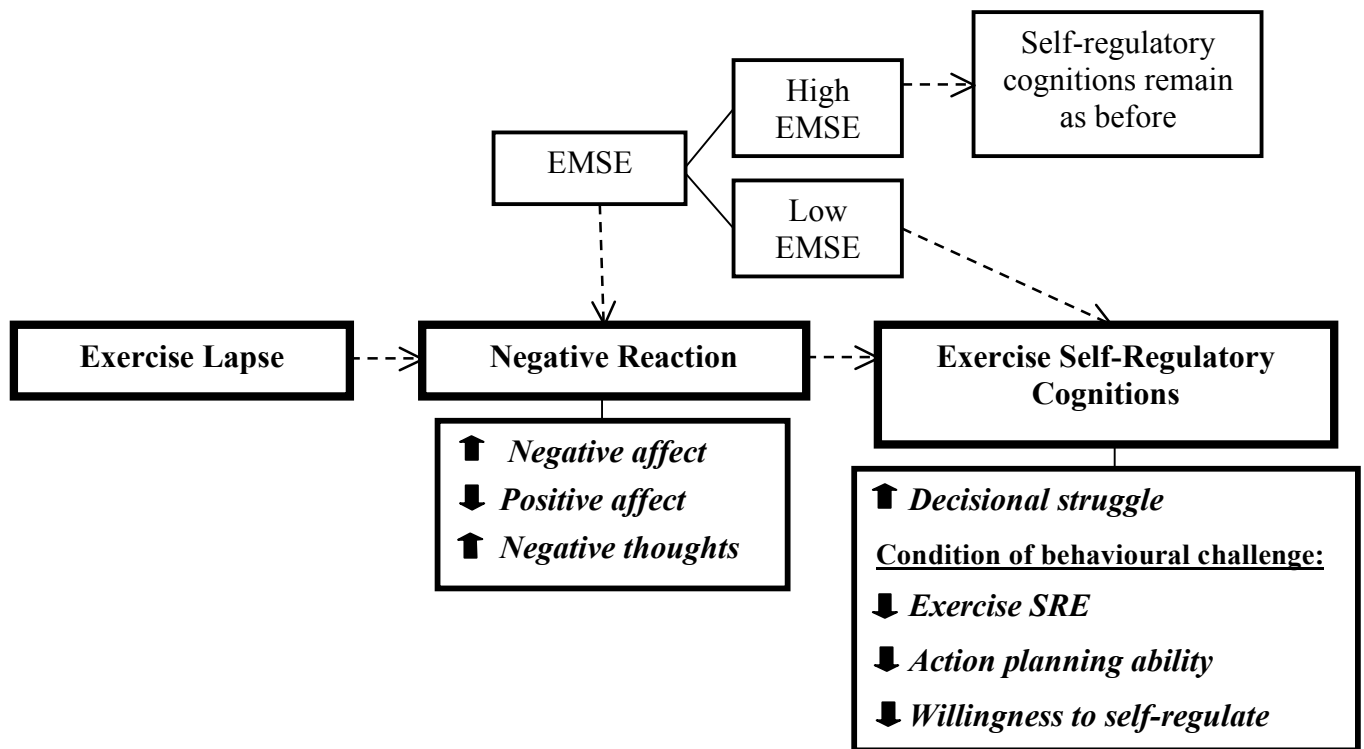


Figure 1. Conceptual framework of the present study.

### *Purpose and Hypotheses*

The present research aimed to give insight into the experience of lapses in exercise adherence for patients engaged in an exercise therapy program. The primary objective of this research was to examine how negative reactions to lapses impact self-regulatory processes and social cognitions that are shown to be important for managing one's exercise successfully. Therefore, individuals engaged in exercise therapy who read either a message designed to induce negativity about exercise lapsing or a neutral information control message were compared. Specific comparisons are listed below.

Regarding this primary objective, social cognitive theory (cf. Bandura, 1986, 1997) guided the following hypotheses. Compared to the information control group, participants in the experimental treatment condition, who read the negative message about a similar other experiencing an exercise lapse, were hypothesized to:

- (a) report higher negative affect, lower positive affect, and list more negative thoughts; and therefore,
- (c) report higher decisional struggle; and when faced with the behavioural challenge,
- (d) have lower self-regulatory efficacy for future exercise;
- (e) have fewer detailed steps in their action plans; and
- (f) be less willing to do self-regulatory actions in the face of a lapse.

A secondary objective of this study was to determine if emotional self-efficacy, specifically for dealing with reactions to exercise lapses, might have a potential moderating effect on the impact of negative reactions on these social-cognitive outcomes. It was hypothesized that participants with higher emotional self-efficacy would be less affected by the negative lapse scenario and respond more like participants in the

information control condition on all measures. These predictions were based on SCT tenets (cf. Bandura, 1986, 1997). No previous research exists on the moderating effects of emotional self-efficacy with regard to exercise or reactions to exercise lapses. Thus, the current research will be the first to contribute information about the potential moderating effects of emotional self-efficacy in the exercise context.

## Methods

### *Participants and Design*

Forty-four individuals participating in either the Saskatoon Cardiac Rehabilitation or First Step programs were recruited for this study. The Saskatoon Health Region conducts both of these programs, which offer supervised exercise sessions three times per week for individuals with, or at risk for, chronic health problems (e.g., First Step: diabetes, overweight, hypertension, etc.; cardiac rehabilitation: stints, myocardial infarction, by-pass surgery, etc.).

Participants were eligible if they had been attending their respective program (First Step or cardiac rehabilitation) for longer than two months. This specification was in place to ensure that participants had enough experience with exercising to relate to the written scenario about a similar other person in the same program. There were no age or gender restrictions for participation; however, participants had to be able to speak and read English. As this study did not involve an additional component of exercise beyond that in which participants were engaged as part of their normal (standard care) exercise therapy experience, there were no other inclusion or exclusion criteria. The design of this study had one between-groups factor with two levels (i.e., negative lapse treatment message and information control message), with participants randomly assigned to either experimental condition.

### *Measures*

Participants completed two questionnaire packages (see Procedures), which measured demographic and social-cognitive variables and presented stimulus materials. Both the measures and stimulus materials are described below in the order in which



participants received them. Internal consistencies for scales were calculated based upon the data obtained from participants in the present study. See Appendix A for study materials and measures, presented in order as follows: certificate of ethical approval, letter of invitation, consent form, time 1 and 2 questionnaire packages, and debriefing letter. See Appendix B for four examples of the written messages used in the study, presented in order as follows: information message for male cardiac rehabilitation and female First Step participants, and lapse message for female cardiac rehabilitation and male First Step participants.

#### *Time One Measures*

*Demographics.* Information regarding participants' age, gender, marital status, employment status, health-related problems and diagnoses, smoking status, and current and previous exercise experience was gathered. This information was used to describe the volunteer sample and to identify any potential covariates.

*Emotional self-efficacy.* A 6-item measure, which was developed for this study, asked participants to indicate their confidence between 0% (*not at all confident*) and 100% (*completely confident*) for specific strategies to regulate emotion under the circumstance that they miss their scheduled exercise for one to two weeks. An example item is: "Stop myself from worrying about missing my exercise". The mean of the six items was calculated to give an emotional self-efficacy (EMSE) score. This scale was developed based on SCT concepts and past research (Maddux & Lewis, 1995; Muris, 2002). Specific items were based on a 7-item measure of emotional self-efficacy used by Muris (2002) in an adolescent sample. Items were reworded in order to suit an adult population, to address the specific circumstance of lapsing from exercise therapy, and to

match the format of other self-efficacy measures used in the present study. For example, an item from Muris' scale asking "How well do you succeed in not worrying about things that might happen?" was similar to an item in the present scale asking participants to respond to the statement "I am confident I can stop myself from being anxious about what might happen to my health because I missed my exercise". Another item comparison is: Muris: "How well can you give yourself a pep talk when you feel low?" and the present study: "I am confident that I cannot feel down on myself because I missed exercise." Internal consistency of the EMSE scale in the present study was very good with a Cronbach's alpha of .95) (Tabachnick & Fidell, 2001).

*Exercise self-regulatory efficacy.* Participants indicated on a 16-item scale their confidence between 0% (*not at confident*) and 100% (*completely confident*) for specific behaviours around managing their exercise. Responses were regarding the next two weeks of exercise. An example item is: "I am confident that I can arrange my schedule over the next two weeks so that I don't miss any exercise sessions". The components of self-regulation being examined here included: scheduling, goal setting, relapse prevention, and problem solving. A mean score of exercise self-regulatory efficacy (exercise SRE) was calculated. Time 1 exercise SRE was used as a baseline measure to calculate exercise SRE changes from time 1 to time 2 (after experimental manipulation) and was used as a covariate for comparing change scores across experimental groups. The exercise SRE measure was modified from previous exercise research to suit this specific context (Woodgate, 2005). Internal consistency of this measure was very good with a Cronbach's alpha of .97 (Tabachnick & Fidell, 2001).

## *Time Two Measures and Stimulus Materials*

### *First stimulus presentation: Experimental manipulation written messages.*

Participants read either a negative exercise lapse vignette or an information control written message. Both messages were written with a third-person perspective and described the thoughts, actions, and experiences of a similar other participating in exercise therapy.

The exercise lapse vignette was developed using previously mentioned literature, as well as informal interviews with program participants ( $N = 7$ ). The message (approximately 1500 words) was tailored for gender and program (cardiac rehabilitation and First Step) to create, as much as possible, the perception of a similar other, in order to create empathy. In the exercise lapse vignette, the individual misses a series of planned sessions for a variety of reasons and becomes increasingly worried and frustrated. The reasons the character misses exercise included a lack of planning, excuses, and social commitments. They did not include injury, illness, or other valid, uncontrollable reasons for missing exercise. After missing two weeks of exercise, the story ends with no resolution (see Appendix B).

The information control message was matched to the exercise lapse vignette for length and also tailored to gender and program. The content was based on educational material that participants would see at their programs about lifestyle issues, such as diet, exercise, and smoking (see Appendix B). The messages were presented in 14-point font and with 1.5 times spacing to help increase the readability of the message. A shorter version of this message has been used in a study with cardiac rehabilitation participants (Woodgate & Brawley, 2008b).

*Positive and negative affect.* Immediately after reading the written message (negative lapse or information control) participants completed the Positive and Negative Affect Scales (PANAS: Watson, Clark, & Tellegen, 1988). These scales asked participants to rate how they felt at that present moment for 20 mood adjectives (10 positive and 10 negative) on a scale of 1 (*very slightly or not at all*) to 5 (*extremely*). The structure of these scales allowed for positive and negative affect to be analyzed separately making it possible to determine if the exercise lapse group experienced higher negative affect or lower positive affect. Scores on both positive and negative affect were calculated by summing the values given to each item, allowing for a maximum possible score of 50 (i.e., 5 \* 10 items = 50). The Cronbach's alpha for internal consistency for the positive items was .88 and for the negative items was .92 in the present study. These values are comparable to the internal consistencies reported by scale developers (positive:  $\alpha = .89$ , negative:  $\alpha = .85$ ) (Watson, Clark, & Tellegen, 1988).

*Acute exercise thoughts.* Participants were instructed to list in the space provided any specific negative and positive thoughts they might have when contemplating whether or not to exercise in the next two weeks, considering the message they just read. Along with the affect measure, the thought listing allowed the researchers to check for any acute negative effects of the exercise lapse message, compared to the informational control message. Past research has measured acute exercise thoughts using open-ended methods (Gyurcsik & Brawley, 2001; Gyurcsik et al., 2002; Gyurcsik & Estabrooks, 2004). Different from this past research, the present study was interested in the overall tone of prospective thinking (i.e., positive or negative) that was most cognitively available to participants at the time and therefore examined the number of positive versus negative

thoughts, but not the frequency with which participants anticipated having the thoughts. The protocol used for coding and scoring thoughts is described in the Results section.

*Decisional struggle.* A 1-item measure on a scale between 1 (*no struggle*) and 9 (*tremendous struggle*) asked participants to indicate how much these thoughts (see above) would make them struggle with their decision to exercise or not in the next two weeks. This measure has been used previously in exercise research (Gyurcsik & Brawley, 2000, 2001; Gyurcsik et al., 2002; Gyurcsik & Estabrooks, 2004). Decisional struggle served as an indication of the degree of cognitive rumination participants might experience as a result of negative thoughts, affect, and self-evaluations (Gyurcsik & Brawley, 2000; Maddux & Lewis, 1995).

*Second stimulus presentation: Behavioural challenge scenario.* All participants were instructed to imagine a realistic scenario where they could not attend their regular exercise program sessions for two weeks, but would try to maintain their regular exercise routine. The hypothetical reason given was that the program facility was closed for emergency repairs and thus all program sessions were cancelled. This scenario presented a problem and potential lapse that participants had to solve while making action plans and considering their willingness to self-regulate in the face of a lapse. Therefore, the cognitive difficulty of the task was increased, making it more likely to see the effects of any negative reactions in the lapse treatment group.

*Exercise self-regulatory efficacy.* The exercise SRE measure at time two was the same as time one, with the exception that participants were asked to consider their confidence to carry out the self-regulatory actions under the circumstances of the behavioural challenge (time 2  $\alpha = .98$ ). Mean exercise SRE at time 2 was calculated from

the 16 items and used to compare groups at time 2. Exercise SRE change scores (mean at time 2 – mean at time 1) were also calculated. Change scores, with time 1 exercise SRE as a covariate, were used to identify any group differences in efficacy changes from time 1 to time 2.

*Action plans.* After reading about a behavioural challenge situation where they could not attend the regular supervised exercise sessions, participants were asked to list as many details as possible (e.g., where, when, and how) concerning their action plan for exercise during the hypothetical building closure. Action plans were analyzed according to the number of specific steps participants wrote down (see Results for a more detailed explanation). Action plans have been examined in previous exercise research using likert-type scales measuring the degree to which participants have made plans about when, where, and how to exercise (Luszczynska, 2006; Woodgate, 2005). The present study took a different approach by asking participants to write out each step and judging the quality and quantity of the information in order to probe cognitive deficits as a result of negative cognitive ruminations about exercise lapsing.

*Willingness to self-regulate (in the face of a lapse).* This 6-item measure was created for the present study to see what types of actions (or non-action) participants would likely take under the challenge circumstances. In contrast to efficacy beliefs, which address specific confidences, this measure questioned participants' willingness, or how likely they would be to actually behave in a certain way. Social cognitive theory predicts that people will select activities they feel capable in and avoid situations they feel are too difficult (Bandura, 1997; Maddux & Gosselin, 2003). However, efficacy beliefs are not meant to measure how likely or willing people are to follow through with

the behaviour (Maddux & Gosselin, 2003). This measure allowed us to see how the experience of the lapse might influence people's willingness to carry out potentially adaptive behaviours and not just make themselves feel better about missing exercise or avoid the situation. Therefore, this measure gives insight into how they might be affected by the lapse. On a scale between 1 (*definitely will NOT*) and 9 (*definitely WILL*), participants indicated how likely they would be to ask for assistance, seek alternate plans, make a plan of action, view the lapse situation as a challenge, or do nothing and just wait it out. Internal consistency of this scale was low with a Cronbach's alpha of .59, so the psychometric properties of the scale were further analyzed (Tabachnick & Fidell, 2001). See Results section for an explanation.

*Message manipulation check.* Participants filled out a 9-item measure on a scale of 1 (*strongly disagree*) to 9 (*strongly agree*) indicating whether the written message they read at the beginning of the session was: realistic, believable, aimed at someone like them, informative, and understandable. These items were borrowed from a message manipulation check previously used in a study with this population (Woodgate & Brawley, 2008b). In addition, participants were asked to what degree, 1(*very little*) to 9 (*very much*), they could empathize with the person in the story (i.e., their thoughts and feelings, problems and challenges, and actions). Internal consistency of this scale was good ( $\alpha = .85$ ) (Tabachnick & Fidell, 2001).

### *Procedures*

Volunteer recruitment proceeded according to methods suggested by the manager of both exercise therapy programs. Recruitment materials were placed at the facility including posters and letters of invitation. The exercise therapists who work with the

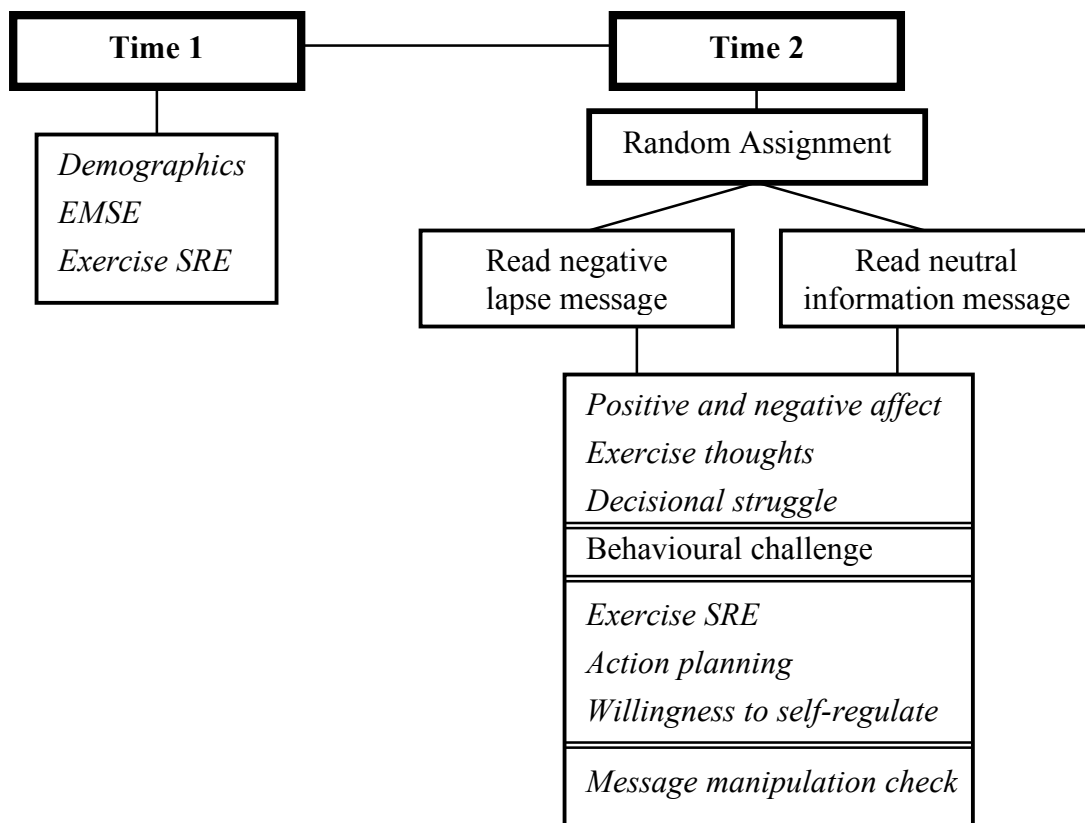
program participants made initial personal contact with potential volunteers either by approaching them individually or through announcements made during group exercise sessions. Interested individuals received an information letter and left their contact information in a drop-box at the program site. The researcher phoned these individuals to explain the study in greater detail and schedule appointments with those who decided to volunteer.

Participants completed questionnaires at two meeting times, approximately one week apart. The questionnaires were completed in a quiet meeting room at the program site. At the first meeting, which lasted approximately 25 minutes, the researcher went through the consent form orally with participants and written consent was obtained before time 1 measures were completed. The first questionnaire measured demographic information, emotional self-efficacy, and exercise self-regulatory efficacy.

At the second meeting, which lasted approximately 45 minutes, participants were randomly assigned into either the control or treatment group. Based on this assignment, participants were given either the neutral information control written message or the negative exercise lapse written message. Participants took approximately ten minutes to read the message. The second questionnaire was given to participants at this time, which began with the PANAS measure of affect. Following, participants were asked to record their positive and negative thoughts and decisional struggle about exercising in the upcoming week. At this point in the questionnaire, the participants read a short challenge scenario describing a situation where the building was closed for emergency repairs and they would be unable to attend their regular exercise sessions for the next two weeks. Participants were then asked to create an action plan to maintain their regular exercise



routine despite being unable to go to their regular sessions. In addition, they reported their exercise self-regulatory efficacy under these conditions and their willingness to carry out specific actions to help them recover after missing a few exercise sessions during this time. Finally, participants completed a manipulation check in which they reported their perceptions and degree of empathy regarding the message they read at the beginning of the meeting. Figure 1 represents these experimental procedures.



*Figure 2.* Graphic representation of experimental study procedures.

#### *Analytic Plan*

All analyses were conducted using SPSS version 15.0 for Windows. The first stage of data analysis involved verifying accurate data entry, adjusting for any missing

values or outliers, testing normality, and examining basic descriptive data. Groups were compared on baseline measures using multivariate and univariate procedures, as appropriate, for parametric data and chi-square procedures for nonparametric data. The baseline measures examined were: EMSE, time 1 exercise SRE, and demographic measures. Groups were also compared using one-way ANOVA on ratings on the message manipulation check. Following this, two main strategies were used to address study hypotheses. First, a one-way between-groups MANOVA was conducted to examine any differences between the information control and lapse treatment group on outcome variables. Second, ANCOVA was conducted to compare exercise SRE change scores between experimental groups using time 1 exercise SRE as a covariate. For further detail and explanation of analytical procedures, see Results section.

## Analytical Procedures and Results

### *Data Management*

After all data from participants were entered into the SPSS database, and before beginning analysis, the data set was examined for missing data, outliers, and skewed and kurtotic data. The steps taken for each of these cases are described below.

#### *Missing Data*

Three study variables contained missing data in a total of eight instances. These variables were: the time 2 exercise SRE, positive affect, and negative affect. To address this small amount of missing data, procedures for estimating missing data with mean values were followed, as outlined by Tabachnick and Fidell (2001).

Where whole scales were missing (six instances), the group mean for each item was used. For example, if the individual had been randomized to the information control group, that group's mean for 'item 1' of the scale was used, and so on to complete the whole scale. In cases where only one or two items were missing from a scale, the individual's mean for the other items on that scale was used to fill in the missing item(s). These procedures are conservative and allow the researcher to maximize potential power in a small sample, as well as maintain equal sample size across experimental conditions (Tabachnick & Fidell, 2001).

#### *Outliers*

Consideration of the frequency distribution of the data revealed outliers for some variables. Outliers were those scores that were more than 3.29 standard deviations away from the entire sample mean (i.e.,  $z\text{-score} > 3.29$ ). Outliers were treated following recommended procedures by Tabachnick and Fidell (2001), in order to reduce their

impact while conserving all data. Six outlier data points were detected and all were negative. Each outlier data point was moved within one raw score unit of the next lowest score. For example, on time 1 exercise SRE (range 0-100) an outlying score of 4.6 (i.e., > 3.29 z-score criterion) was moved to 24, one unit below the next lowest score of 25.7. This new position resulted in a value within the range of a normal distribution while preserving the rank of the person's response relative to others in the distribution.

The above guidelines were followed for all variables except decisional struggle, which was extremely positively skewed in three instances. Another method was used to identify outliers using a boxplot, which identifies data that are greater than 1.5 times the interquartile range above or below the upper or lower quartiles (Tabachnick & Fidell, 2001). Additionally, instead of being moved to within one raw score unit of the next highest score as traditionally recommended, a quarter of a unit was used. These data points kept their ordinal position, while also maintaining their position compared to the distribution of responses on this variable. This modification to recommended guidelines allowed the researcher to meet multiple goals. The skewness of the variable was reduced dramatically and the modified scores still represented the true variability of the responses in this exploratory study.

### *Normality*

Skewness and kurtosis values were calculated for all study variables using the entire sample. Non-normal variables were considered those that had skewness or kurtosis values that were greater than twice the standard error of skewness or kurtosis (Tabachnick & Fidell, 2001). After removing outliers (as described above), four study variables were skewed. Time 1 SRE and SRE change scores were negatively skewed

(respectively: -3.2, -3.3); decisional struggle and negative affect were positively skewed (respectively +3.1, +2.9). Kurtosis values were acceptable for all variables.

To address the skewed variables, an investigative approach was taken to assess the impact of the skewed variables on the results of multivariate analysis. Negatively skewed variables (decisional struggle, time 1 SRE) were transformed through reflection (i.e., scores subtracted from a constant one unit above highest score to create a variable with positive skewness) followed by square root, as suggested by Tabachnick and Fidell (2001). However, MANOVA procedures conducted on the transformed and untransformed variables were robust to skewness. No benefit was gained from transformations; therefore analysis with raw data was reported.

#### *Analytic Plan for Experimental Hypotheses*

Coding and scoring procedures were carried out for acute thoughts and action plans. Significance for all statistical analyses was set at  $p < .05$ . Initially, to compare participants from cardiac rehabilitation and First Step, and to verify randomization to experimental groups was effective, chi-square procedures and one-way between-groups MANOVA, with follow-up univariate  $F$  tests, were conducted on non-parametric and parametric demographic variables, respectively. One-way between-groups ANOVA was used to compare groups on baseline measures of EMSE and exercise SRE. This procedure was also used to compare how groups rated the message using the manipulation check.

Primary analysis used a one-way ANCOVA to compare exercise SRE change scores between groups, while controlling for baseline exercise SRE scores. A one-way

between-groups MANOVA was used to compare the two experimental conditions on outcome variables to determine the effect of the negative lapse scenario.

### *Demographics*

Forty-four individuals participated in the study and were equally divided between the information control and lapse treatment conditions. The majority of the participants were recruited from the cardiac rehabilitation program (73%) and the remaining portion was from the First Step program. Demographic comparisons of First Step and cardiac rehabilitation participants were nonsignificant, excluding comparisons for gender and frequency of program and independent exercise. See Appendix C for these results.

At the time of the study, participants had been enrolled in their respective program an average of 15 months (median = 8 months), with 68% of the sample attending for less than one year. Prior to joining their respective exercise therapy program, 86% of participants did not exercise regularly. Half of the participants reported having experienced a two-week lapse in exercise therapy. On a scale of 1(*strongly disagree*) to 9(*strongly agree*), participants indicated they believed that exercising regularly had an important impact on their health, at this time in their life ( $M = 8.1$ ,  $SD = 1.6$ ).

Gender representation in this sample was relatively equal (i.e., 57% male). The average age of participants was 62.2 years ( $SD = 8.8$  years), with 46% of the sample over 60 years. Three-quarters of the participants were married and two-thirds were retired. Over half of the participants were former smokers.

Randomization to experimental groups was effective, as revealed by nonsignificant results on all except one demographic comparison. The exception was that

those randomized to the lapse treatment condition reported a higher frequency of program exercise,  $F(1, 40) = 6.9$ ,  $p = .012$ . However, randomized groups were no different on total average exercise frequency (i.e., program plus independent exercise). Appendix D presents this demographic information.

*Specific Coding and Scoring of Acute Thoughts and Action Plans and Psychometric  
Evaluation of the Willingness to Self-Regulate Scale*

*Acute Thoughts*

Participants' exercise-related acute thoughts were entered into an excel spreadsheet. Each thought was given a code of '0' for neutral thoughts (example: "stopping smoking was the best thing I ever did"), '1' for negative thoughts (example: "my health problems interfere with the program"), or '2' for positive thoughts (example: "I very much enjoy coming and exercising"). Positive thoughts are those that may encourage exercise, negative thoughts may discourage exercise, and neutral thoughts would have no impact (Gyurcsik & Brawley, 2000). After initial coding of all thoughts was complete, the researcher checked the coding at two separate time points for consistency and errors.

After the coding process was completed, a thought score was calculated by methods previously used in the exercise literature, whereby negative thoughts were subtracted from positive thoughts (Gyurcsik & Brawley, 2000, 2001; Gyurcsik et al., 2002). For example, if a participant recorded 3 positive thoughts and 1 negative thought, their thought score would be +2 ( $3-1 = 2$ ). The resulting score gives an indication of the overall valence of acute exercise thoughts recorded by the participant.

### *Action Plans*

Participants recorded action plans for continuing exercise under circumstances where their regular program was cancelled. Each step in the plan was recorded in an excel spreadsheet and coded to be either general or specific in nature. Following the coding of all plan steps for the first time, the researcher checked the coding at two separate time points for consistency and errors.

Research in cardiac rehabilitation exercise has shown that the self-regulatory strategy of making specific plans about where, when, and how to exercise, as well as how to deal with specific exercise barriers, increases cardiac rehabilitation exercise participation (Luszczynska, 2006; Sniehotta et al., 2006). For the present study, steps in action plans were given a code for specific if they included this type of concrete information. For example, a specific step in a plan would be: “Use my treadmill at home” or “30 minute walk daily in the condo halls”. A general step in the plan may contain some information about when, where, or how to exercise, but does not reflect a firm or specific plan and is therefore considered less effective. Example steps coded as general include: “Make an effort to go for a walk”, or “Exercise at home”.

The variable used for analysis was the number of specific steps recorded by the participant. People reacting negatively to the lapse scenario were expected to be less effective at creating action plans, therefore having fewer specific ideas.

### *Willingness to Self-Regulate Scale*

Psychometric evaluation of the willingness to self-regulate scale indicated that the Cronbach’s alpha for all six items was inadequate ( $\alpha = .59$ ) (Tabachnick & Fidell, 2001). To determine if more than one factor was present among the scale items, a Principal



Component Factor Analysis with Varimax Rotation was conducted (see Appendix E). This analysis revealed that five scale items loaded onto two different factors, and one item (#3) was not strongly related to either of the two factors. Additionally, there were concerns with the face validity of item 3. Participants appeared to have difficulty interpreting the scale direction, so this item was excluded from analysis. Three items (1,2,6) loaded onto one factor with an acceptable Cronbach's alpha of .71 (Tabachnick & Fidell, 2001). These items addressed willingness to view a lapse as a challenge, to make a plan of action, and do something in this lapse situation, as opposed to just hoping it will resolve itself. These items are more general, whereas content of items 4 and 5 represent more specific actions.

Statistically, the remaining items (4 and 5) loaded on a second factor; however, conceptually these items did not fit as a single index. Thus, each item was examined as a 1-item response dependent variable so as not to eliminate items that might shed light on the exploratory research question posed. Both items represent specific actions: item 4 asks the participant's willingness to seek alternatives, such as attending another fitness facility or consulting a personal trainer. Item 5 asks participant's willingness to seek support from others, such as family and friends. All subsequent analyses were conducted using these three dependent variables (i.e., willingness-3 items, willingness-seek alternative, and willingness-seek support).

### *Descriptive Reports and Variable Relationships*

Means and standard deviations of study variables measured at time 1 and time 2 can be found in Table 1. Results of two-tailed bivariate Pearson correlations between

study variables can be found in Appendix F. The magnitude of significant bivariate pearson correlations between study variables ranged between .31 and .70.

### *Primary Hypotheses: Experimental Study*

#### *Baseline Comparisons*

As shown previously, randomization to experimental groups was effective in balancing demographic variables equally across experimental groups. Baseline measures of EMSE and exercise SRE were also not significantly different between groups, indicating no differences existed on these measures prior to the experimental manipulation, EMSE:  $F(1, 42) = .850, p = .362$ ; SRE:  $F(1, 42) = .462, p = .50$ . See Table 1 for group means including EMSE and exercise SRE time 1.

#### *Manipulation Check*

Results of the manipulation check regarding the message participants read at the beginning of time 2 revealed that the messages were rated highly, scoring a mean of 7.4 ( $SD = 1.2$ ) on the scale range of 1 (*strongly disagree*) to 9 (*strongly agree*) using the message manipulation check index. However, an ANOVA revealed that participants in the lapse message treatment group scored the message significantly lower than the group who received the information control message (standard deviations in parentheses),  $M_{\text{lapse}} = 6.9 (1.3)$ ;  $M_{\text{info}} = 7.8 (.73)$ ,  $F(1, 42) = 9.7, p = .003$ .

Although both groups reported that the qualities of the message were high, the obvious difference between the two groups suggested we should further explore each item in the index. Results of this breakdown are presented in the Discussion section.

Table 1

*Information and Lapse Message Groups: Descriptive Statistics for Study Variables*

Variable	Information control		Lapse treatment	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
EMSE (time 1)	73.2	21.2	66.6	25.7
SRE (time 1)	67.3	13.3	64.3	15.9
Positive affect	34.8	5.5	35.5	7
Negative affect	14.2	5.3	17	7
Thoughts score	0.8	3	0.6	2.6
Decisional struggle	2.5	1.8	3	2.4
Time 2 SRE	72	23.7	66.6	27.3
N Specific plans	1.9	1.4	2.1	1.7
Willing 3-items	6.3	1.8	6.3	1.9
Willing-alternative	3.5	3	4.9	2.5
Willing-support	5.2	2.7	5	2.4
SRE change score	-11.3	17.3	-11.4	18.4

*Note.* *N* = 44 for the entire sample (*n* = 22 in each of the information control and lapse treatment conditions). Unless indicated as time 1, measures were taken post-experimental manipulation. EMSE and Exercise SRE were rated on 0% (*not at all confident*) to 100% (*completely confident*). Affect was out of a possible total of 50 for each positive and negative. Thoughts score was calculated by (*N* positive – *N* negative); therefore lower scores are more negative. Decisional struggle was rated on 1 (*no struggle*) to 9 (*tremendous struggle*). Higher number of specific plans was considered better. Willingness scales were rated on 1 (*definitely will not*) to 9 (*definitely will*). SRE change scores = (time 2 – time 1). *M* = means. *SD* = standard deviations.

*Experimental Effects*

Participants in the treatment group were hypothesized to report higher negative affect, lower positive affect, and more negative thoughts in response to the exercise lapse message. They were also expected to report higher decisional struggle, lower self-regulatory efficacy for upcoming exercise, be able to write less specific exercise action

plans, and be less willing to carry out actions that require self-regulation in order to resume exercising after a lapse. Compared to the information control condition, the exercise SRE of treatment group participants was hypothesized to decrease from time 1 to time 2. Thus, SRE change scores were calculated by subtracting time 1 scores from time 2 scores and used in ANCOVA analysis. ANCOVA analysis comparing exercise SRE change scores showed no significant differences,  $F(2, 41) = .218, p = .805$ .

Results of the between-groups MANOVA indicated the treatment and control groups were not significantly different on the outcome measures described above,  $F(9, 34) = .80, \text{Wilks' } \lambda = .825, p = .619$ . Normally analyses would end here. However, to be certain that that interpretation of the omnibus  $F$  test did not overlook any difference on any individual variable in an exploratory study (cf. Bock, 1975), subsequent univariate  $F$  tests were conducted. These indicated that there were no significant group differences on any of the study variables. Refer to Appendix G for these nonsignificant results, as well indication of whether or not any differences between group means were in the hypothesized direction.

There are many possible explanations for the lack of experimental effects seen in this study; however, there are three possible explanations that are most evident. Ineffectiveness of the stimulus material, small sample size and therefore lack of power, and the particular characteristics of the sample (i.e., exercise maintainers). These reasons will be addressed in more detail in the Discussion section.

### *Secondary Hypotheses: Experimental Study*

#### *Moderating Effects of Emotional Self-Efficacy*

Analysis was also planned to test the moderating effects of emotional self-efficacy (EMSE) on outcome measures across experimental conditions. However, considering that EMSE was expected to potentially moderate experimental effects and these were not elicited, this particular test of moderation was not conducted. Nonetheless, in light of interest in the construct of EMSE, which has never been measured with respect to exercise in the published literature, exploratory analysis was undertaken and will be presented at the end of the next section.

### *Post Hoc Analysis of Related Research Questions*

#### *Introduction to Post Hoc Analysis*

Given that experimental treatment effects were nonsignificant, post hoc analysis of related research questions was carried out based on previous exercise research and social cognitive theory (Bandura, 1997). As described in the introduction, past research has shown differences between positive and negative thinkers on exercise behaviour and social cognitions (i.e., exercise SRE, decisional struggle) (cf. Gyurcsik & Brawley, 2000). This line of research helped to provide reasoning for the present original experimental study that negative reactions to the lapse scenario might influence social-cognitive outcomes. The hypothesis that valence of thinking, measured by listing acute positive and negative exercise thoughts, would be related to social-cognitive measures, such as decisional struggle and self-efficacy, is same for past research and the present post hoc analysis. Therefore, post hoc analysis was carried out given this opportunity to compare the present results to previous research.

SCT tenets and research suggest that negative thoughts lead to cognitive ruminations and decreased self-efficacy cognitions (cf. Bandura, 1997). Low self-efficacy is detrimental to success at self-regulating exercise behaviour (cf. Bandura, 1997). Relating to acute thoughts, Peterson (2000) discusses little optimism, which concerns specific expectations about positive outcomes. This is as opposed to big optimism, which represents a generalized expectancy for future positive outcomes (Peterson, 2000). Little optimism affects specific thoughts and actions performed in situations, leading to more adaptive responses (Peterson, 2000). Acute exercise-related thoughts represent a measure of little optimism/pessimism, and are therefore expected to influence specific beliefs about exercise in the near future. Recall that, acute positive exercise thoughts have been defined as those that encourage exercise and decision-making, while acute negative thoughts either discourage exercise and decision-making or make individuals struggle with these decisions and behaviour (cf. Gyurcsik & Brawley, 2000). Previous exercise research has examined acute exercise-related positive and negative thoughts and found they have significant relationships with exercise consistency, decisional struggle, and exercise SRE (cf. Gyurcsik & Brawley, 2001; Kendzierski & Johnson, 1993).

#### *The Present Post Hoc Analysis*

Given the exploratory nature of the present research and the possibility to extend previous research to this special population, post hoc analysis was conducted. Recall, that the present study hypothesized that those reacting negatively (i.e., more negative thoughts and negative affect) to the experimental message would have greater decisional struggle and lower exercise SRE. Using this initial reasoning about negative thoughts and based on previous research, it was hypothesized that those participants who were more negative

in their thinking would respond in a fashion similar to that observed in previous research. Among the variables measured in this study, previous exercise research has mainly focused on the effects of thoughts on decisional struggle and exercise SRE. For the present study, it was speculated that all time 2 social-cognitive measures (i.e., positive and negative affect, willingness to self-regulate indexes, and action plans) would reflect differences between positive and negative thinkers. It was also speculated that positive thinking would be related to higher levels of exercise, similar to previous research (Gyurcsik & Brawley, 2000; Gyurcsik et al., 2002).

Emotional self-efficacy, which was measured at time 1, was also examined regarding its relationship to other social-cognitive measures and to valence of acute thinking. Given the exploratory goal for measuring this particular variable in the study, no specific hypothesis was advanced.

#### *Plan for Post Hoc Analysis of Related Research Questions*

Groups of positive and negative thinkers were created and compared on demographic variables using MANOVA and chi-square procedures. One-way between-groups MANOVA was used to compare positive and negative thinkers on time 2 measures (i.e., positive and negative affect, decisional struggle, exercise SRE, willingness to self-regulate indexes, and action plans). Post hoc univariate *F* tests revealed where significant differences existed. Given the unequal numbers and standard deviations of the positive and negative groups, assumptions of MANOVA were tested (i.e., Box's test of equality of covariance matrices, Levene's test of equality of group error variances). One violation occurred for Levene's test (decisional struggle:  $p = .014$ ). Analysis used Type III sums of squares to ensure that the analysis was robust (Tabachnick & Fidell, 2001).

Positive and negative thinkers were also compared on EMSE and exercise frequency using one-way ANOVA.

Two-tailed bivariate correlations were conducted to examine relationships between social-cognitive measures. Multiple regression analyses were conducted to predict exercise SRE from other social cognitions. To address interest in the exploratory measure of EMSE, two-tailed bivariate correlations of EMSE and outcome variables were examined.

### *Positive and Negative Acute Exercise Thoughts*

#### *Comparisons of Positive and Negative Thinkers*

In order to examine group differences between positive and negative thinkers, participants were split into two groups, similar to previous research (Gyurcsik & Brawley, 2000, 2001; Gyurcsik, 2002). Recall that thought scores were calculated by subtracting the number of positive thoughts from the number of negative thoughts. Negative thinkers ( $n = 11$ ) were classified as those whose thought score was (-1) or more negative, and positive thinkers ( $n = 29$ ) were those with a score of (+1) or more positive. This classification of positive and negative thinkers excluded four participants who had a thought score of zero. Thus, analysis of group differences between positive and negative thinkers used a sample of 40 participants. However, these four neutral participants were retained in correlation and regression analyses, where thought score was used as a continuous variable. One-way ANOVA revealed that thought scores were significantly different between positive and negative groups,  $F(1, 38) = 76.2, p < .001$ , indicating that the groups were empirically different and could be compared based upon this difference.



*Group demographic comparisons.* Positive and negative groups were compared on demographic factors as outlined previously. Results of these comparisons indicated that the groups were not significantly different on any demographic variables. (Exercise frequencies were not included in these comparisons since they were hypothesized to differ between positive and negative thinkers.) See Appendix H.

*Group differences on social-cognitive measures.* Positive and negative thinkers were compared on social-cognitive measures using one-way between-groups MANOVA. The omnibus MANOVA was significant,  $F(8, 31) = 2.72$ , Wilks'  $\lambda = .588$ ,  $p = .021$ ,  $\eta^2 = .412$ , observed power = .860. Subsequent univariate  $F$  tests revealed that positive and negative thinkers were significantly different in the hypothesized direction for positive affect,  $F(1, 38) = 5.1$ ,  $p = .03$ ,  $\eta^2 = .118$ , decisional struggle,  $F(1, 38) = 8.4$ ,  $p = .006$ ,  $\eta^2 = .181$ , exercise SRE at time 2,  $F(1, 38) = 6.8$ ,  $p = .013$ ,  $\eta^2 = .152$ , willingness-3 items,  $F(1, 38) = 10.0$ ,  $p = .003$ ,  $\eta^2 = .208$ , and willingness-seek support,  $F(1, 38) = 5.4$ ,  $p = .025$ ,  $\eta^2 = .125$ . See Table 2 for adjusted mean comparisons for positive and negative thinkers on social-cognitive measures.

Table 2

*Positive and Negative Thinkers: Descriptive Statistics for Social-Cognitive Measures*

Social-cognitive measure	Positive thinkers		Negative thinkers	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Positive affect	36.6*	5.9	31.8*	6.3
Negative affect	15.9	6.3	15.5	7.3
Decisional struggle	2.2**	1.7	4.3**	2.6
Time 2 SRE	76.9*	23.1	55.1*	25
N Specific plans	1.9	1.5	2.1	1.6
Willing 3-items	6.9**	1.7	5.0**	1.6
Willing-alternative	4.9	2.7	3.2	2.9
Willing-support	5.6*	2.3	3.6*	2.4

*Note.*  $n = 29$  for positive thinkers,  $n = 11$  for negative thinkers. Affect was out of a possible total of 50 for each positive and negative. Exercise SRE rated on 0% (*not at all confident*) to 100% (*completely confident*). Decisional struggle was rated on 1 (*no struggle*) to 9 (*tremendous struggle*). Higher number of specific plans was considered better. Willingness scales were rated on 1 (*definitely will not*) to 9 (*definitely will*). *M* = adjusted means. *SD* = standard deviations.  
 \*  $p < .05$ . \*\*  $p < .01$ .

*Group differences on EMSE.* One-way ANOVA revealed that positive and negative thinkers were not significantly different on EMSE,  $F(1, 38) = .60$ ,  $p = .445$ . See Appendix I for a comparison of group means.

*Group differences on exercise frequency.* Groups differed significantly on exercise frequency (days per week), with positive thinkers doing more of their respective program of exercise than negative thinkers,  $F(1, 36) = 9.5$ ,  $p = .004$ . Positive thinkers also reported more independent exercise than negative thinkers,  $F(1, 36) = 5.4$ ,  $p = .026$ . See Table 3 for group comparisons.

Table 3

*Comparisons of Exercise Frequencies for Positive and Negative Thinkers*

Type of exercise	Positive thinkers		Negative thinkers	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Program	3.0**	0.5	2.4**	0.5
Independent	1.8*	1.4	0.7*	0.9
Total	4.8**	1.6	3.1**	1

*Note.*  $n = 28$  for positive thinkers,  $n = 10$  for negative thinkers. Frequency of exercise measured in days per week. Total = program + independent. *M* = means. *SD* = standard deviations.

\*  $p < .05$ . \*\*  $p < .01$ .

*Correlation and Regression Analyses*

Social-cognitive theory emphasizes the bi-directional relationships between social-cognitions and proposes that acute cognitive and emotional states are a source of efficacy information (Bandura, 1997). In addition, self-efficacy is theorized to be a proximal predictor of behaviour, and self-regulatory efficacy has been suggested as a key outcome variable that research in exercise therapy adherence should address (AACVPR, 1999; Bandura, 1997, 2004; Woodgate & Brawley, 2008a).

Previous research in healthy exercisers has shown relationships specifically between decisional struggle, acute thoughts, and exercise SRE (Gyurcsik & Brawley, 2000, 2001). Regression analyses were conducted to examine these relationships in a sample of individuals exercising for disease prevention and rehabilitation. Based on SCT tenets, as well as results and suggestions from past research, prediction of exercise SRE from thoughts and decisional struggle was the focus of these analyses. Given concurrent measurement, the predictors were entered into the regression equation as a block.

A second and exploratory question was to investigate the contributions of EMSE for exercise lapse situations to the prediction of exercise SRE. Inasmuch as EMSE has not specifically been examined in the exercise context, and thus there was no basis for its order of entry into the regression equation, it was entered last as the second step, as recommended by Cohen, Cohen, West, and Aiken (2003). This procedure allowed for the determination of EMSE contributions to the prediction of exercise SRE over and above that of thoughts and decisional struggle.

Correlation relationships between social-cognitive measures can be seen in Appendix F. Thought score and decisional struggle were significantly negatively correlated ( $r = -.40$ ). Exercise SRE was significantly positively correlated with: EMSE ( $r = .45$ ), positive affect ( $r = .32$ ), thoughts ( $r = .46$ ), and willingness (3-item measure) ( $r = .56$ ); and significantly negatively correlated with decisional struggle ( $r = -.49$ ).

*Prediction of exercise SRE from thoughts and decisional struggle.* Results of the multiple regression analysis indicated this overall model was significant; thoughts and decisional struggle contributed approximately equally to the prediction of exercise SRE,  $F(2, 41) = 9.83, p < .0001, R^2_{\text{adjusted}} = .291$ . See Table 4.

Table 4

*Contributions of Thoughts and Decisional Struggle to the Prediction of Exercise SRE*

Predictor variable	B	Beta	<i>p</i>
Thought score	2.9	0.321	0.027*
Decisional struggle	-4.3	-0.36	0.014*

*Note.*  $N = 44$ . Predictor variables were entered together as a block. B = unstandardized coefficients, Beta = standardized coefficients.

\*  $p < .05$ .

*Prediction of exercise SRE: Contributions of EMSE.* The question of whether EMSE contributed additional variance beyond that of thoughts and decisional struggle was also explored. Thoughts and decisional struggle were entered in step 1, followed by EMSE in step 2. This overall model was significant,  $F(3, 40) = 9.7$ ,  $R^2_{\text{adjusted}} = .378$ ,  $p < .0001$ . EMSE predicted unique variance beyond thoughts and decisional struggle,  $R^2_{\text{change}} = .097$ ,  $p = .013$ . Interestingly, decisional struggle was not a significant predictor in this exploratory model. See Table 5.

Table 5

*Contributions of Thoughts, Decisional Struggle, and EMSE to the Prediction of Exercise SRE*

Predictor variable	B	Beta	<i>p</i>
Step 1			
Thought score	2.92	0.319	0.02*
Decisional struggle	-3.10	-0.254	0.072
Step 2			
EMSE	0.355	0.329	0.013*

*Note.*  $N = 44$ . B = unstandardized coefficients, Beta = standardized coefficients.

\* $p < .05$ .

#### *Emotional Self-Efficacy*

Two-tailed bivariate pearson correlation analysis revealed three significant relationships. EMSE was found to be significantly negatively correlated with negative affect ( $p = .007$ ), and decisional struggle ( $p = .034$ ), and significantly positively correlated with time 2 SRE ( $p = .002$ ). No other significant relationships were found. Table 6 shows the correlations between EMSE and social-cognitive measures.

Table 6

*Bivariate Correlations between EMSE and Social-Cognitive Measures*

Variable	EMSE
Pos. affect	.045
Neg. affect	-.402**
Thought score	.134
Dec. struggle	-.320*
Time 2 SRE	.453**
N Specific steps	-.061
Will - 3 item	.268
Will - alternative	.179
Will - support	-.052

*Note.*  $N = 44$ .

\*  $p < .05$ . \*\*  $p < .01$

## Discussion

The Discussion section is presented in three main parts. To begin, post hoc results are discussed in relation to theory and previous research. Next, the original experiment is discussed in terms of its strengths and limitations, and possible explanations are considered for the lack of experimental effects. Finally, potential future research directions are discussed regarding both the original experiment on negative reactions to lapses and positive and negative thinking related to exercise.

### *Social-Cognitive Comparisons between Positive and Negative Thinkers*

Overall, positive thinkers in this study exhibited a better psychological state of mind from which to self-regulate their exercise than negative thinkers. Comparisons between acute positive and negative thinkers showed that five out of eight social-cognitive measures significantly differed between positive and negative thinkers. Specifically, positive thinkers were higher in positive affect, exercise SRE, willingness to self-regulate in the face of a lapse (3-item scale), and willingness to seek support from others. Positive thinkers were also lower in decisional struggle about engaging in upcoming exercise. The effect size for the overall model comparing positive and negative thinkers was large ( $\eta^2 = .412$ ), and the effect sizes for individual significant predictors were small, ranging from .118 to .208 (Cohen, 1992).

### *Exercise Behaviour in Positive and Negative Thinkers*

In addition to the social-cognitive findings, differences in reported exercise levels were found between positive and negative thinkers. Specifically, positive thinkers reported a mean of 3.0 days per week of maintenance program exercise compared to negative thinkers with a mean of 2.4 days per week. Independent exercise levels were

also higher in positive thinkers compared to negative thinkers at 1.8 days per week compared to the negative thinkers at 0.7 days per week (see Table 3 in Results). These results suggest a potential link between negative thinking and lower levels of exercise.

The differences observed are similar to past findings by Gyurcsik and colleagues (2002) showing that acute positive exercise thoughts are related to more consistent exercise behaviour and negative thoughts are related to less consistent behaviour. What might be possible reasons for this relationship? There may be multiple types of acute negative and positive thoughts about exercise for those in maintenance exercise therapy. For example, negative thinkers may feel that missing exercise is discouraging and could be in this frame of mind due to not meeting their goals. From a theoretical perspective, such thoughts could cause participants to struggle more with making decisions about exercising. Such efficacy-relevant information could potentially lead to lower self-regulatory efficacy. On the other hand, positive thinkers in this study appeared to be satisfied with their greater level of exercise. Using theory to frame a possible explanation, their positive thoughts may result from meeting or exceeding their goals. Consequently, they may struggle less with making decisions about exercising. In turn, this forethought may be part of the experience that potentially leads to higher self-regulatory efficacy.

Whereas these maintainers are sustaining exercise at a level suitable for reduced risk of future problems, it is ironic that the activity level for the sample does not reach that recommended by ACSM for older adults with and at risk for chronic disease. The ACSM guidelines recommend 30 minutes of moderate or greater exercise on most, if not all, days of the week (Nelson et al., 2007). Only 18 out of 44 people in this sample reported engaging in five or more days per week of exercise in total.



### *Relationship to Theory*

Results of post hoc analyses concerning social cognitions and acute positive and negative exercise thoughts provide support for some of the tenets of social cognitive theory (Bandura, 1997). Specifically, cognitive and affective states are posited to be a source of self-efficacy information and have an impact on motivated behaviour (Bandura, 1986, 1997). According to Maddux (1997), managing maintenance exercise behaviour requires conscious, mindful forethought. The present results coincide with the notion that forethought about upcoming exercise (i.e., acute exercise-related thoughts) may be relevant information for exercisers, potentially used to make decisions about actions, including making these decisions easier or harder (i.e., more or less struggle).

Also, the population in this study (exercise therapy maintainers) arguably has additional health-related challenges to consider when contemplating their exercise compared to exercisers not at risk for disease. For example, participants from this study might consider the impact of *not* exercising on their condition or worry about managing symptoms, such as angina, during exercise.

The results of regression analyses suggest that acute cognitive states may be potential sources of self-efficacy information (Bandura, 1997). Specifically, this potential was supported given that acute cognitive factors (decisional struggle, thoughts) assessed before the behavioural challenge was presented were predictive of exercise SRE assessed following participants' consideration of the challenge.

### *Relationship to Past Research*

Results support past findings by Gyurcsik and colleagues showing that positive acute exercise thoughts are related to lower decisional struggle, higher exercise SRE, and

increased exercise adherence (Gyurcsik & Brawley, 2000, 2001; Gyurcsik et al., 2002). In addition, the present results extend past findings beyond the asymptomatic population and older adult exercisers to a sample engaged in exercise maintenance for chronic disease risk management (i.e., Gyurcsik et al., 2002; Gyurcsik & Estabrooks, 2004). Also, additional differences between positive and negative thinkers (positive affect, willingness to self-regulate in the face of a lapse, and willingness to seek support from others in a lapse situation) were found, adding to the breadth of variables examined in previous research.

Results also addressed a need identified in a recent review of self-regulatory efficacy for exercise in cardiac rehabilitation (Woodgate & Brawley, 2008a). The review emphasized the importance of conducting future research that examined exercise SRE as an outcome measure and studying exercise therapy maintainers. The present study addressed all of those suggestions.

### *Exploratory Findings*

Post hoc analysis of variables explored as having a possible relationship to positive and negative thinking concerned measures of written action plans, willingness to self-regulate, and emotional self-efficacy. Given that this is the first time such measures have been examined in a population exercising for chronic disease management, a discussion of their results and future use is warranted.

*Action plans.* Post hoc analysis of action plans that participants stated in response to the challenge of having to exercise on their own for a short time period (2- week program closure) concerned participants' ability to write out specific plan steps. Although past research has shown action planning to be an important variable among cardiac

rehabilitation exercisers (Luszczynska, 2006; Sniehotta et al., 2006), no significant differences between positive and negative thinkers were found. The null result could be due to several factors. First, participants had no systematic practice at writing action plans, and thus were equally poor in communicating these specifically. Second, all participants had a reasonable amount of experience with maintenance exercise therapy, possibly rendering them equally adept at coming up with ideas for their exercise plans.

Action planning may be a skill that needs to be learned and practiced, and positive thinking about exercise does not simply translate into well-formed plans. When rehabilitation exercisers practice this planning in intervention studies, the research has shown the effectiveness of this skill in translating intentions to behaviour (Luszczynska, 2006; Sniehotta et al., 2006). Future research should continue to examine this variable systematically and consider the impact of situations that present a challenge to planning (Bandura, 1997; Shields & Brawley, 2006). For example, making specific and effective action plans may be more difficult when resuming exercise after a lapse or sickness or during changes in routine, such as a vacation or having out of town visitors. Additionally, other evaluations of ability to plan may be informative, such as having participants rate both their confidence to do each step and the feasibility of their plans.

*Willingness to self-regulate.* Recall that the purpose of this measure was to capture participants' willingness to carry out self-regulation in the face of multiple challenges (i.e., an exercise lapse during temporary program cancellation). Upon psychometric evaluation, the scale was broken into three dependent measures (3-item measure, willingness to seek support from others, and willingness to seek alternatives). Positive and negative participants differed in their willingness to self regulate (3-item

scale), and willingness to seek support from others, but did not differ in their willingness to seek alternative options for exercise. This latter finding is perhaps not surprising given the nature of the maintenance exercise therapy program and high level of contact and supervision by staff members. Participants may not consider another facility an option, even when it is a safe option.

Given that willingness to self-regulate was a new measure, the differences found between positive and negative people add to findings from past research by Gyurcsik and colleagues (2002). Positive and negative thinkers may have differential levels of readiness to approach challenges they face in adhering to exercise. Overall, positive individuals were more willing to try a variety of things to adapt to and solve the problem of lapsing during a temporary program cancellation. By contrast, negative individuals may be focused on the adherence problem at hand, but feel they cannot do anything about it. Maddux and Lewis (1995) suggest that low efficacy is related to individuals dwelling on themselves and their worry or guilt, rather than being focused on the task and solving the problem. Thus, these individuals may be unable to come up with adherence-related solutions.

Theory and research evidence suggest that highly efficacious people are more likely to complete and persist with adherence behaviour (cf. Maddux & Gosselin, 2003). Therefore, understanding how willing or likely people are to make choices to undertake actions to solve problems, such as lapsing, seems like an important outcome that would be related to self-regulatory efficacy. Indeed, in the present study, willingness (3-item scale) was correlated with exercise SRE ( $r = .560$ ). Understanding what people are willing to do to help themselves is important because efficacy for those actions could

potentially be improved and motivate people to get through challenging times. Future research might examine how efficacy relates to willingness and whether both variables can collectively predict future adaptive actions better than each variable alone.

*Emotional self-efficacy (EMSE).* Maddux and Lewis (1995) suggest that the construct of EMSE has not been examined in psychological research generally, and more specifically, in exercise research (Woodgate, 2005). In the present study, this construct was explored in relation to positive and negative thinking, the prediction of exercise SRE, and correlations with other social-cognitive variables. Items on the EMSE measure referred to one's ability to control negative emotions when facing an exercise lapse.

EMSE did not differ significantly between positive and negative thinkers. However, it is important to note that lower EMSE was related to higher negative affect across the whole sample. Negative emotions can be debilitating and compounded by the expectation that they will continue (i.e., have low efficacy to control them). The moderating effects of EMSE in lapse situations should be examined in future research given the modifiable nature of efficacy and the relationship of EMSE to higher negative affect, greater decisional struggle, and lower exercise SRE in this study.

Regarding the exploratory question concerning the relation of EMSE to exercise SRE, EMSE was found to be a significant predictor of exercise SRE beyond the contributions of thoughts and decisional struggle. It should be noted that when EMSE was added in the second step to the regression model, thoughts and EMSE were significant predictors, but decisional struggle was not. Given the possibility that EMSE may be a possible determinant or potential moderator of exercise SRE, its continued investigation in future research seems warranted.

The current EMSE scale provides a starting point for measurement and may be adapted to other relevant situations besides reactions to exercise lapses. For example, Woodgate (2005) suggests that EMSE should be examined in the cardiac rehabilitation context in relation to the anxiety that is reported as being associated with increases in physical symptoms (e.g., angina, fatigue) and with the resumption of exercise after a cardiac event.

#### *Possible Alternative Explanations for Positive-Negative Differences*

It could be argued that other factors account for the differences between participants who think positively and negatively in relation to their maintenance exercise. In particular, selective effects due to sampling, such as differences in participants' previous exercise experience, co-morbidities, and experience with lapses, might account for differences. Recall, however, that statistical comparisons showed no differences in demographic characteristics between positive and negative groups (See Appendix H). These characteristics included important factors, such as the length of time participants were in their respective program and the number and type of medical conditions they reported. Additionally, positive and negative thinkers were not different on other important characteristics including: whether or not they had experienced a two-week lapse in exercise therapy, if they were a regular exerciser prior to joining the program, and the degree to which, at the time of the study, they felt exercising was important for their health. Given that there were no differences between groups, none of these potential demographic characteristics provided a strong argument for selective effects that might account for differences observed between positive and negative thinkers in this sample of exercise therapy maintainers.

### *Limitations of the Post Hoc Investigation*

There are limitations regarding results of the analysis comparing positive and negative thinkers that concern generalizability, the post hoc nature of analysis, the reliability of the coding of positive and negative thoughts, and the concurrent nature of measurement. First, participants consisted of a volunteer sample from exercise therapy programs in one municipality's health region, thereby limiting generalizability to similar exercise therapy populations in other municipalities. Second, the post hoc nature of this analysis meant that differences in the sizes of comparison groups could not be remedied (versus a planned experiment). Third, to increase the face validity of the classification of participants' as positive and negative thinkers, multiple researchers, as opposed to one researcher, would have coded positive and negative thoughts, which would have enabled the calculation of inter-rater reliability. Finally, the concurrent measurement of variables only permits the exploration of the relationships between measures, but not the direction of these relationships.

### *The Original Experiment: Strengths and Limitations*

Given that there was no effect of the message manipulation in the original study, it seems appropriate to dissect its advantages and disadvantages in an effort to consider why the manipulation was unsuccessful in causing hypothesized effects.

#### *Strengths*

The original experiment had several strengths worth noting including methodological, conceptual, and theoretical strengths. Methodologically, the study employed random assignment of participants to experimental conditions. The experiment used messages, which were written based on informal pilot interviews using the

population from which participants were sampled. The control message was adapted from previous research in this population. Messages were matched for length. Additionally, the messages were tailored by gender and program. Overall, care was taken to make the messages as relevant as possible in order to increase potential impact.

An additional methodological strength was that a manipulation check measure was included in the protocol. The purpose of this check was to address how participants felt about the content and readability of the messages, as well as the extent of empathy participants felt with respect to the similar other person in the described situation in each condition. This measure provided empirical data that suggested potential reasons why the message was ineffective.

Conceptually, this study was based in social cognitive theory and hypotheses were advanced on the basis of multiple sources of literature (i.e., social-cognitive exercise research, relapse-prevention model, and mood-behavior model). An important conceptual strength of this study was its unique content. The examination of exercise lapses from a social-cognitive perspective has received minimal attention in exercise research. This is surprising given that lapsing is recognized as a common phenomenon within the exercise adherence literature (Dishman, 1988, 1994; Sallis et al., 1990).

### *Limitations*

*Experimental stimulus material.* Participants in the experimental condition read a message describing a similar other struggling with an exercise lapse. The reading of this vignette was hypothesized to provoke empathy and negative feelings (affect and thoughts) about similar struggles the reader might have experienced or could possibly experience in future. This reaction was expected to be related to decreased self-regulatory



efficacy, willingness to self-regulate, and action planning ability, as well as increased decisional struggle. The control message was intended to have neutral effects on these measures. Despite careful pilot work, the lapse message failed to evoke the negative reaction intended.

Possible explanations for the failure to cause the intended negative reaction are as follows. Detailed analysis of the 9-item manipulation check using one-way ANOVA procedures provided evidence that participants who read the lapse message rated its quality significantly lower on four of the items compared to their information control counterparts, revealing a telling pattern (see Table 7). Interestingly, comparisons of participant ratings indicated that participants who read the negative lapse message thought that it was aimed at someone like them to a lesser extent ( $p < .001$ ). Furthermore, they empathized to a lesser degree with the character's problems and challenges ( $p = .007$ ), and actions ( $p = .019$ ). They also found it less informative than individuals reading the information message ( $p = .001$ ), which is logical considering the educational content of the information versus lapse message. Collectively, these results suggest that the participants distanced themselves from the negative vignette and the similar other person described (i.e., similar exercise therapy participant). Several explanations can be considered for this finding.

Table 7

*Message Manipulation Check: Item-by-Item Mean Response Comparisons of Information and Lapse Messages*

Brief item description	Mean: Information control	Mean: Lapse treatment	<i>F</i>
Informative	7.8 (1.1)	6.3 (1.6)	12.7**
Aimed at people like me	8.1 (0.9)	6.0 (2.3)	15.9**
Believable	8.1 (1.0)	7.6 (1.5)	2.1
Easy to read	8.0 (1.1)	7.9 (1.3)	0.2
Easy to understand	7.9 (1.2)	8.0 (1.0)	0.2
Accurate	8.0 (1.0)	7.5 (1.5)	2.0
Empathized with thoughts and feelings	7.5 (1.8)	6.6 (2.0)	2.4
Empathized with problems and challenges	7.8 (1.3)	6.3 (2.1)	8.0**
Empathized with actions	7.4 (1.8)	5.8 (2.2)	6.0*

*Note.*  $n = 22$  for information control group,  $n = 22$  for lapse treatment group. Standard deviations are in parentheses. Degrees of freedom for all comparisons = (1, 42). Responses rated on 1 (*strongly disagree*) to 9 (*strongly agree*) and 1 (*very little*) to 9 (*very much*) for empathy questions. \* $p < .05$ . \*\*  $p < .01$ .

In contrast to the negative message used here, past research in the cardiac rehabilitation population effectively used a positive message to increase participants' self-regulatory beliefs (Woodgate & Brawley, 2008b). The affective component of the message (positive versus negative) may be a potentially important difference in the effectiveness of these messages. Latimer, Salovey, and Rothman (2008) discuss the importance of considering the moderating effects that an individual's beliefs have when looking at the effectiveness of positively (gain-framed) and negatively (loss-framed) framed messages. For example, they provide evidence that a dispositional tendency towards acting in ways to either ensure the presence of positive outcomes (promotion

focus) or the absence of negative outcomes (prevention focus) is an important moderator of message effectiveness (Regulatory Focus Theory: Higgins, 1998). Participants who read the negative lapse message in the current study might have ignored the negative quality of the message because of a promotion-focused motivational tendency. Further investigation regarding regulatory focus in maintenance exercise therapy participants could enhance the effectiveness of the informational messages they receive about behaviour change.

Social comparison theory (Festinger, 1954) offers one potential explanation for why lapse message participants may have distanced themselves from the similar other described in the message. The theory posits that humans have a drive to compare to themselves to others in order to self-evaluate. Self-enhancers are people who tend to perceive themselves more positively than they perceive others (Festinger, 1954). As well, comparison is more readily done when the opinion and actions of the object of comparison are perceived to be similar to oneself (Festinger, 1954). Those who read the negative lapse vignette might have chosen to not associate themselves with the similar other exercise therapy participant who was doing poorly. Instead, they may have chosen to focus on thoughts about themselves that enhance their self-image (e.g., imagining that they would have handled the struggles of lapsing more successfully or would never find themselves in that position of failing).

Interestingly, those negative thinkers ( $n = 5$ ) who read the lapse message rated it to be aimed at someone like them and had a higher degree of empathy with the similar other person described than those positive thinkers ( $n = 16$ ) who read the lapse message (see Table 8). Although the differences between positive and negative thinkers were not

statistically significant for participants in the lapse vignette condition (likely due to power), this finding appears to be in line with explanations from social comparison theory. Namely, negative thinkers did not find themselves in a position to compare downwardly to the person struggling with adherence and were able to relate more with the character in the negative lapse vignette. Positive thinkers may have compared themselves with the person in the story, but felt that they were better at managing exercise and therefore did not relate to the person struggling in the lapse vignette. Similar differences between positive and negative thinkers were not seen for readers of the information control message. The proportions of positive and negative thinkers were similar in both message conditions (information control - positive thinkers:  $n = 13$ , negative thinkers:  $n = 6$ ).

Overall, it appears that the participants in this study were sufficiently adaptive. They would have struggled with previous lapse experiences, such that they were able to maintain generally positive, adaptive self-perspectives resistant to acute manipulations of their affect.

*General limitations.* Other limitations of the original study should be taken into account. The volunteer sample was experienced with exercise therapy and being adaptive and was supported by a structured exercise program. A random sample of maintenance participants might yield different results. This may have been a potential contributing factor to the nonsignificant impact of the negative lapse message.

Also, the sample size was small relative to the number of dependent variables being examined (Tabachnick & Fidell, 2001). Post hoc power calculations that were conducted using the experimental data found that the observed power of the primary

experimental analysis (i.e., between-groups MANOVA) was low at .32. This finding indicated that the analysis might have benefited from increased power (Tabachnick & Fidell, 2001).

Table 8

*Lapse Message Manipulation Check: Item-by-Item Mean Response Comparisons of Positive and Negative Thinkers*

Brief item description	Mean: Positive thinkers	Mean: Negative thinkers
Informative	6.7 (1.6)	5.2 (1.5)
Aimed at people like me	<b>5.8 (2.3)</b>	<b>6.8 (2.7)</b>
Believable	7.5 (1.5)	7.6 (1.7)
Easy to read	8.1 (0.8)	7.1 (2.2)
Easy to understand	8.1 (0.8)	7.6 (1.7)
Accurate	7.4 (1.5)	7.6 (1.5)
Empathized with thoughts and feelings	<b>6.3 (2.1)</b>	<b>7.8 (1.1)</b>
Empathized with problems and challenges	<b>6.2 (2.3)</b>	<b>7.0 (1.2)</b>
Empathized with actions	<b>5.7 (2.2)</b>	<b>6.6 (2.5)</b>

*Note.*  $n = 16$  for positive thinkers,  $n = 5$  for negative thinkers. Standard deviations are in parentheses. Degrees of freedom for all comparisons = (1, 19). Responses rated on 1 (*strongly disagree*) to 9 (*strongly agree*) and 1 (*very little*) to 9 (*very much*) for empathy questions. Bold items are discussed in text.

### *Future Research*

#### *Exercise Lapses*

Future research aiming to understand the long-term dynamic process of adhering to exercise therapy should include more examination of lapsing as part of the adherence process. Research on lapses in other health behaviours, such as diet, has been much more

intensive than research on exercise lapses (Dishman, 1988). This original study represented an experimental approach toward this aim, including novel measures of the impact on exercise self-regulatory cognitions, such as willingness and action planning.

Relative to future experiments of this type, asking people to recall or relate to feeling badly about a lapse appears to be a challenging task. Perhaps a first step in understanding what detrimental reactions may occur when people react negatively to a lapse is to examine moderating factors of their reactions. Based on the results of the present post hoc analysis regarding positive and negative thinkers, and in light of differences observed in the message manipulation check (i.e., negative thinkers associating with the lapse story to a higher degree), it appears that negative thinking about exercise might be a moderator of reactions to lapses. Also, emotional self-efficacy may be a potential moderating factor of reactions that should be studied in future research.

A third possible moderator to examine would be an individual's tendency to remain task-focused in their ability to solve a lapse problem versus the tendency to remain self-focused and unable to problem-solve. Maddux and Lewis (1995) have suggested that such differences may be evident among individuals who differ in their self-efficacy. A fourth possible moderator for examination would be to consider the complications presented by chronic disease, such as whether or not individuals view their health status as controllable or uncontrollable. This perspective may influence coping style (i.e., active or avoidant) (cf. Cameron & Leventhal, 2003). Applying these notions of negative thinking, emotional self-efficacy, problem-solving ability, and disease

perceptions and coping to the study of lapses could be promising areas for future research that enrich our understanding of lapses in the picture of long-term exercise adherence.

### *Positive and Negative Thinking*

The differences found between positive and negative thinkers in this study extend and add to past findings. Future research in this area could examine situations that might moderate negative thinking, such as being new to an exercise program, recovering from a long absence from exercise, or transitioning from a structured, health care leader-guided program to the self-management of exercising independently. Understanding these common situations that require the individual's adaptation would offer information for practitioners, such as exercise therapists for the purposes of teaching coping strategies and self-regulatory skills to assist exercise self-management.

Another interesting situation to consider in this population is the impact of symptomatology on exercise cognitions, such as positive and negative thinking. Experiencing symptoms during exercise, such as angina, worsening health, or experiencing symptoms in daily life may be anxiety-producing situations that provoke negative thinking. Indeed, Cameron and Leventhal's (2003) common-sense model of self-regulation of health and illness suggests that people's perceptions of their health and capabilities are influenced by bottom-up processes, such as experiences of symptoms and emotions.

In the present study, the degree of rumination as measured by the decisional struggle item was moderately correlated to negative thinking. Future research in this area may benefit from a more in-depth measure of rumination, as it may represent a

mechanism by which negative thinking is operating on social cognitions, such as efficacy and planning.

A final point to consider regarding future research directions relative to positive and negative thinking concerns the amount of exercise being achieved by the positive thinkers. Even though, on average, positive thinkers in the study did better than negative thinkers in being active, their self-reports of typical weekly maintenance exercise indicated at least 53% were not regularly meeting the ACSM guidelines for frequency of exercise for adults of their age. The guidelines for this population recommend 30-60 minutes of moderate aerobic activity a minimum of five days per week (Nelson et al., 2007). Furthermore, guidelines recommend increasing intensity of exercise over time to maintain an appropriate level of challenge and encourage individuals to exceed the guidelines for time and frequency, if appropriate, in order to receive further health benefits (Nelson et al., 2007). Consider, also, that this picture of exercise participation levels does not include probable lapses and regular interruptions from activity that would further decrease exercise levels. Lapsing may be even more of a problem when individuals are attempting to reach these recommended *higher* levels of exercise than they are currently obtaining.

Future research attempting to look at factors relating to adherence should include the notion of lapsing in the understanding of maintenance exercise therapy and also urge those positive people, who may be “satisfied” with their current level of exercise (both frequency and intensity), to increase their activity to reach levels high enough for health benefits.



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## APPENDIX A

### STUDY MATERIALS AND MEASURES

Certificate of Ethical Approval

Recruitment: Letter of Invitation

Consent Form

Time 1 Questionnaire Package

Time 2 Questionnaire Package

Debriefing Letter

# CERTIFICATE OF ETHICAL APPROVAL



UNIVERSITY OF  
SASKATCHEWAN

Behavioural Research Ethics Board (Beh-REB)

## Certificate of Approval

PRINCIPAL INVESTIGATOR  
Lawrence Brawley

DEPARTMENT  
Kinesiology

BEH#  
07-78

INSTITUTION(S) WHERE RESEARCH WILL BE CONDUCTED (STUDY SITE)  
University of Saskatchewan  
Saskatoon SK

STUDENT RESEARCHERS  
Karen Glazebrook

SPONSOR  
SOCIAL SCIENCES AND HUMANITIES RESEARCH COUNCIL OF CANADA (SSHRC)

TITLE  
Study Exercise Lapses

APPROVAL DATE  
08-May-2007

EXPIRY DATE  
07-May-2008

APPROVAL OF  
Application  
Recruitment Material  
Consent Form  
Questionnaires

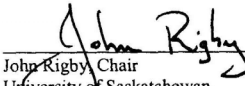
### CERTIFICATION

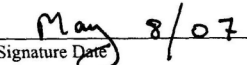
The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

### ONGOING REVIEW REQUIREMENTS

In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: <http://www.usask.ca/research/ethical.shtml>

  
John Rigby, Chair  
University of Saskatchewan  
Behavioural Research Ethics Board

  
Signature Date

Please send all correspondence to:

Ethics Office  
University of Saskatchewan  
Room 306 Kirk Hall, 117 Science Place  
Saskatoon SK S7N 5C8  
Telephone: (306) 966-2084 Fax: (306) 966-2069

## RECRUITMENT: LETTER OF INVITATION

Dear Saskatoon Cardiac Rehabilitation/ First Step Program Participant,

We are researchers from the College of Kinesiology at the University of Saskatchewan. We are interested in cardiac rehabilitation and First Step physical activity. It is not unusual for people to start such exercise programs but then stop (lapse), which can have a negative effect on their health. By participating in this study, you would be helping us to understand reasons why people lapse (even if *you* never have), so we can help them continue their regular physical activity and enjoy maintaining the benefits to their health. We hope that this knowledge will lead to improvements in the exercise programs for others like you.

### Who supports this research?

The Saskatoon Cardiac Rehabilitation and the First Step program staff support this research. It has also received clearance through the Research Ethics Board at the University of Saskatchewan, and the Saskatoon Health Region.

### We are looking for volunteers who:

- Have been participating in **Saskatoon Cardiac Rehabilitation Program** or the **First Step Program** for *between 2 months and 1 year*.

If you decide to learn more about this short survey study, here is how to proceed:

**Step 1.** Please write your **name and phone number** on the **attached slip** and put it in the drop box provided, *or* give this information to Rick or Lianne. By doing this, you are simply making it possible for the researcher to contact you by phone to further explain the study.

**Step 2.** The researchers will then contact you in about a week to discuss the study and schedule times, at your convenience, for you to ask questions, provide informed consent, and complete the study if you decide to do so.

### Step 3. Here is what you will be doing for the study:

- a) You will have 2 appointments, at your convenience. The first will be about 20 minutes, and the second about 35 minutes.
- b) At both appointments you will complete questionnaires that ask about your thoughts, feelings and plans regarding physical activity. During the second meeting, you will also read a short story (1 page) about an exercise program participant. **For your convenience**, you can complete the questionnaires in a group setting in a room at the Field House/Saskatoon Soccer Centre (*refreshments provided*). It could be either before or after the time you normally go to exercise. You may also suggest an alternative time and place. *One of the researchers will be there to answer any questions you may have and to assist you as needed.*

- c) All of the responses you provide will be kept confidential.
- d) You will receive **\$5.00** for your participation, and upon study completion your name will be entered in a **draw to win one of two \$50.00 gift certificates** for a local restaurant of your choice.

**What are my rights as a volunteer?**

Involvement in this study is voluntary and you have the right to withdraw at any time. All of your questionnaire responses will be kept completely confidential. Also, your decision to participate or not will have no effect on participation in your cardiac rehabilitation or First Step program.

**What about feedback after the study?**

At the end of the study, we will provide **group results** and feedback to the Saskatoon Cardiac Rehabilitation and First Step programs staff. If you request, we will mail you a copy of these results. To maintain your privacy, no individual responses, results or identification will be included.

**Your help is important**

We appreciate your time and hope that you decide to help us with this important research! Volunteering a little time now may help to improve an already good program in the future. Thank you for your help!

Sincerely,

Dr. Larry Brawley  
Professor & Canada Research Chair  
College of Kinesiology  
University of Saskatchewan  
**Phone: 966-1076**  
Email: [larry.brawley@usask.ca](mailto:larry.brawley@usask.ca)

Karen Glazebrook  
Investigator  
College of Kinesiology  
University of Saskatchewan  
**Phone: 717-8349**  
[karenglazebrook@gmail.com](mailto:karenglazebrook@gmail.com)

***Please write your name and phone number on the attached slip, and put it in the drop box.  
Thank you!***

***Please tear this slip off, write in your name and phone number, and put it in the  
drop box provided.***

I am interested in learning more about participating in this survey study:

NAME: \_\_\_\_\_ PHONE NUMBER: \_\_\_\_\_

## CONSENT FORM

Dear Saskatoon Cardiac Rehabilitation/ First Step Study Participant,

You are invited to participate in the study entitled: “*Studying Exercise Lapses*”. Please read this form carefully, and feel free to ask questions you might have.

**Researchers:**

Dr. Lawrence Brawley, College of Kinesiology, University of Saskatchewan

Phone: (306) 966-1076

Email: larry.brawley@usask.ca

Karen Glazebrook, M.Sc. Student, College of Kinesiology, University of Saskatchewan

Phone: (306) 717-8349

Email: karenglazebrook@gmail.com

**Purpose and Procedure:** The purpose of this study is to understand how you are affected by potential temporary lapses in your exercise routine, and how you cope with this situation. If you choose to volunteer for this study, you will meet the researcher at two different times, about a week apart. At the first meeting (about 20 minutes long), you will answer questions about your demographics, and thoughts about exercise. At the second meeting (about 35 minutes long), you will read a short story about an exercise program participant and answer questions about your thoughts and feelings about exercising, and plans to cope with an exercise lapse.

**Potential Risks:** There are no known or anticipated risks from participating in this study.

**Potential Benefits:** You will receive \$5.00 cash for participating in this study. Upon completion of this study, your name will be entered in a draw to win one of two \$50 gift certificates for a local restaurant of your choice. Additionally, by participating in this study, you may provide us with potentially useful information about how to help exercise program participants successfully adhere to exercise.

**Confidentiality:** The questionnaire will not ask for your name. All questionnaires will be numerically coded so that individuals are known only to the investigators named above. Consent forms will be stored separately from your questionnaires. After analysis, all data identifying individuals will be destroyed. The remainder will be kept in a locked laboratory to which only the investigators have access. The group data from this study may be presented in scholarly journals and at academic conferences, but no individuals can be identified from these group results.

**Right to Withdraw:** Your participation is voluntary, and you may withdraw from the study for any reason, at any time, without penalty of any sort (without affecting your Cardiac Rehabilitation or First Step program in any way). Furthermore, you can refuse to

answer individual questions on the questionnaire. If you withdraw from the study at any time, any data that you have contributed will be destroyed upon your request.

**Questions:** If you have any questions concerning the study, please feel free to ask at any point. You are also free to contact the researchers at the numbers provided above if you have questions at a later time. This study has been approved on ethical grounds by the University of Saskatchewan Behavioural Research Ethics Board on May 8, 2007. Any questions regarding your rights as a participant may be addressed to that committee through the Ethics Office (966-2084). Out of town participants may call collect. You may find out about the results of this study by contacting the researchers who will mail you a summary of the results.

**Consent to Participate:** I have read and understood the description provided above; I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I consent to participate in the study described above, understanding that I may withdraw this consent at any time. A copy of this consent form has been given to me for my records.

Participant's Signature: \_\_\_\_\_

Witness' Signature: \_\_\_\_\_

Date: \_\_\_\_\_

*Thank you for your help with this study. We greatly appreciate the time that you are taking to complete this questionnaire.*

*Sincerely,*

Dr. Lawrence Brawley  
Professor & Canada Research Chair  
College of Kinesiology  
University of Saskatchewan

Karen Glazebrook  
M.Sc. Student  
College of Kinesiology  
University of Saskatchewan

## TIME 1 QUESTIONNAIRE PACKAGE

### DEMOGRAPHICS and EXERCISE HISTORY

**IMPORTANT:** The information below is strictly for the purpose of describing participants *in general* and for record keeping. *This information will be kept private and confidential as noted on your consent form.*

**Name:** \_\_\_\_\_

**Program** (please circle): Cardiac Rehabilitation / First Step

**How long have you been a participant in this program?** \_\_\_\_\_ (months)

**ON AVERAGE, how many times per week do you attend Cardiac Rehabilitation or First Step program session(s)?** \_\_\_\_\_ time(s) per week

**ON AVERAGE, how many times per week do you do *independent* exercise outside of the cardiac rehabilitation or First step program sessions (i.e., exercise at home)?**  
\_\_\_\_\_ time(s) per week

**Age:** \_\_\_\_\_ yrs      **Gender:** M ☐ F ☐

**Marital Status:** Please check below beside the appropriate category.

Married ☐      Divorced ☐      Separated ☐      Single ☐      Widowed ☐

**Employment Status:** Please check below beside the appropriate category.

Retired ☐      Homemaker ☐      Employed ☐      Unemployed ☐      Other ☐

**Health-related Problems and Diagnoses:**

Please check below beside all those that apply to you.

Myocardial Infarction	<input type="checkbox"/>
Angina	<input type="checkbox"/>
Bypass Surgery	<input type="checkbox"/>
Angioplasty/Angiogram	<input type="checkbox"/>
Arthritis	<input type="checkbox"/>
Asthma	<input type="checkbox"/>
High Blood Pressure	<input type="checkbox"/>
Diabetes	<input type="checkbox"/>
Pre-Diabetes	<input type="checkbox"/>
Increased Body Weight	<input type="checkbox"/>
Thyroid Problems	<input type="checkbox"/>
High Cholesterol	<input type="checkbox"/>
Stomach Problems	<input type="checkbox"/>
Any Cancer	<input type="checkbox"/>
Other	<input type="checkbox"/>

**Smoking Status:** Please check below beside the appropriate category.

Never Smoked ☐      Past Smoker ☐      Current Smoker ☐

**1. In the 3 months *before* I started the Cardiac Rehabilitation/ First step program, I was *consistently exercising at least 3 times per week*, for more than 30 minutes a session at a moderate intensity (please check the appropriate answer).**

Yes, I did exercise consistently \_\_\_\_\_

No, I did not exercise consistently \_\_\_\_\_

**2. I have *missed 2 consecutive weeks* or more of my scheduled exercise, for any reason, during the months of September to May (please check appropriate answer).**

Yes, I have \_\_\_\_\_

No, I haven't \_\_\_\_\_

**3. To what extent do you believe that exercising regularly (3 X per week), has an important impact upon your personal health and prevention of disease at this time in your life.**

1	2	3	4	5	6	7	8	9
Strongly				Undecided				Strongly
Disagree								Agree



## EMOTIONAL SELF-EFFICACY

People sometimes miss exercise sessions for different reasons. Recall how you felt WHEN YOU HAVE MISSED YOUR EXERCISE for a full week to 2 weeks since you have joined Cardiac Rehab/First Step. If you have never missed, imagine doing so. Now answer the following questions:

**How confident are you that you can do the following actions, if you miss your regular exercise for 1-2 weeks in the future? Please complete all questions to the best of your ability, using the scale below.**

**Instructions:** Place the appropriate number from the scale (0 – 100) on the line following each statement.

<b>0%</b>	<b>10%</b>	<b>20%</b>	<b>30%</b>	<b>40%</b>	<b>50%</b>	<b>60%</b>	<b>70%</b>	<b>80%</b>	<b>90%</b>	<b>100%</b>
<b>not at</b>					<b>somewhat</b>					<b>completely</b>
<b>all confident</b>					<b>confident</b>					<b>confident</b>

*Example:*

*“Let other participants know about the exercise I’m doing at home” 50%\_\_*

Now complete the questions please.

**When I miss my regular exercise for 1-2 weeks in the future, I am confident that I can...**

1. Stop myself from worrying about missing my exercise. \_\_\_\_\_
2. Cheer myself up even if I feel bad about missing exercise. \_\_\_\_\_
3. Not feel down on myself because I missed my exercise. \_\_\_\_\_
4. Stop myself from being upset or angry because I missed my exercise. \_
5. Manage feelings like guilt about missing exercise, so those feelings are in check.  
\_\_\_\_\_
6. Stop myself from being anxious about what might happen to my health because I missed my exercise. \_\_\_\_\_

## EXERCISE SELF-REGULATORY EFFICACY

The following is a list of behaviours associated with participating in your exercise for the **next 2 weeks**. Please consider each specific behaviour as it applies to you.

**Please indicate how confident you are that you can complete each of the following behaviours over the next 2 weeks using the scale below.**

Place the appropriate number from the scale (0 – 100) on the line following the statement.

<b>0%</b>	<b>10%</b>	<b>20%</b>	<b>30%</b>	<b>40%</b>	<b>50%</b>	<b>60%</b>	<b>70%</b>	<b>80%</b>	<b>90%</b>	<b>100%</b>
<b>not at</b>					<b>somewhat</b>					<b>completely</b>
<b>all confident</b>					<b>confident</b>					<b>confident</b>

*Example:*

*“Let my exercise leader know about the exercise I’m doing at home”*        50%   

**Over the next 2 weeks, I am confident that I can ...**

1. Complete exercise sessions three times per week, for the next 2 weeks no matter what. \_\_\_\_\_
2. Plan for the attendance of my exercise sessions for three times per week along with my weekly activities. \_\_\_\_\_
3. Arrange my schedule to exercise three times per week, no matter what, over the next 2 weeks. \_\_\_\_\_
4. Make a definite plan to restart exercise right away if I should miss any sessions during the next 2 weeks. \_\_\_\_\_
5. Make up other times to be active when I miss any of my three regular exercise sessions during the next 2 weeks. \_\_\_\_\_
6. Make sure that I do not miss more than one day of exercise due to other obligations during the next 2 weeks. \_\_\_\_\_
7. Organize the next 2 weeks’ of my time and responsibilities around each exercise session no matter what. \_\_\_\_\_
8. Develop plans to maintain the goals for the frequency of my weekly exercise, for the next 2 weeks. \_\_\_\_\_
9. Follow through with my goals for frequency of weekly exercise, for the next 2 weeks, even though it may be difficult at times. \_\_\_\_\_

The following items concern ***your ability to deal with lapses in your exercise frequency.***  
Please rate how confident you are to do the following actions **over the next 2 weeks.**  
Place the appropriate number from the scale (0 – 100) on the line following the statement.

<b>0%</b>	<b>10%</b>	<b>20%</b>	<b>30%</b>	<b>40%</b>	<b>50%</b>	<b>60%</b>	<b>70%</b>	<b>80%</b>	<b>90%</b>	<b>100%</b>
<b>not at</b>					<b>somewhat</b>					<b>completely</b>
<b>all confident</b>					<b>confident</b>					<b>confident</b>

**Over the next 2 weeks, I am confident that I can ...**

1. Develop solutions to cope with potential barriers that can interfere with my exercise schedule. \_\_\_\_\_
2. Resume regular exercise when it is interrupted, such as when I miss exercise for a few days. \_\_\_\_\_
3. Resume regular exercise when it is interrupted such as when I miss exercise for a full week or more. \_\_\_\_\_
4. View lapses in my exercise program over the next 2 weeks as challenges to overcome rather than failures. \_\_\_\_\_

**INSTRUCTIONS:** Many people report encountering a “**problem**” that interferes with their regular exercise regimen (e.g., being too tired, having too many work or social commitments, being ill, being injured, being on vacation). Keep this kind of “problem” in mind when responding to the following items.

Please rate how confident you are that you could use the following problem-solving strategies in order to maintain your regular exercise regimen **over the next 2 weeks.**

**During the next 2 weeks, I am confident that I can ...**

1. Concentrate my efforts on doing something about my exercise problem. \_
2. Make a plan of action to deal with my exercise problem. \_\_\_\_\_
3. Put aside other activities (e.g., work, social activities, TV) in order to concentrate on maintaining my regular exercise. \_\_\_\_\_

## TIME 2 QUESTIONNAIRE PACKAGE

Now that you have read the story about someone like you in an exercise program for disease prevention, please read the instructions and complete the following items to the best of your ability. Some items may sound similar, but please think of each one separately. All of your answers will be kept confidential. Please feel free to ask any questions you may have about items or our instructions so that we can clarify these.

### AFFECT

**INSTRUCTIONS:** This scale consists of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to the feeling or emotion. Indicate *to what extent you feel this way right now*, that is, at the present moment, after reading the message. Use the following scale to record your answers.

1	2	3	4	5
not at all	very slightly	moderately	quite a bit	extremely

*Write the appropriate number in the space next to each word:*

___ interested	___ irritable
___ distressed	___ alert
___ excited	___ ashamed
___ upset	___ inspired
___ strong	___ nervous
___ guilty	___ determined
___ scared	___ attentive
___ hostile	___ jittery
___ enthusiastic	___ active
___ proud	___ afraid

## THOUGHTS

**INSTRUCTIONS:** You may have specific thoughts when thinking ahead about your upcoming exercise. After reading the story about another exerciser like you, please list *any thoughts* about your own exercise during the upcoming two weeks.

*Example: I am really busy on Tuesday night. I will probably be tired when I get up to exercise on Wednesday.*

*Please record thoughts below:*

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

## DECISIONAL STRUGGLE

**INSTRUCTIONS:** Now that you have listed your thoughts about upcoming exercise, please consider *how much these thoughts will make you STRUGGLE with your DECISION to exercise during this upcoming week?*

*Circle the appropriate number between 1(no struggle) and 9(tremendous struggle):*

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
No Struggle				Moderate Struggle				Tremendous Struggle

*Please turn to next page.*

## SCENARIO

*Please imagine the following situation when answering all of the remaining questions:*

“Imagine that **all** the regular sessions for your exercise program are **cancelled** for the next **2 weeks** because your building must be closed for emergency repair. No alternative venue for the program can be arranged because of the short notice.”

*Please turn to next page.*

## EXERCISE SELF-REGULATORY EFFICACY

**INSTRUCTIONS:** The following is a list of items about your confidence in completing behaviors associated with you organizing your own exercise for the **next 2 weeks**, when all your regular sessions are **cancelled**.

Please consider each specific behaviour as it applies to you, **under these circumstances**.

**Use the scale below to indicate your level of confidence beside each item.**

Place the appropriate number from the scale (0 – 100) on the line following the statement.

<b>0%</b>	<b>10%</b>	<b>20%</b>	<b>30%</b>	<b>40%</b>	<b>50%</b>	<b>60%</b>	<b>70%</b>	<b>80%</b>	<b>90%</b>	<b>100%</b>
<b>not at</b>					<b>somewhat</b>					<b>completely</b>
<b>all confident</b>					<b>confident</b>					<b>confident</b>

**Over the next 2 weeks during the building closure, I am confident that I can...**

*\* Time 2 measure of exercise SRE used the same 16 items as time 1, but used different instructions, as seen above. See Time 1 Questionnaire Package for the 16 items on the exercise SRE measure.*

## ACTION PLANNING

**RECALL THE SCENARIO:** Imagine that all regular sessions for your exercise program are cancelled for the next 2 weeks due to building closure.

**INSTRUCTIONS:** What would you do to complete the usual number of times you would exercise in 2 weeks, despite ALL your regular sessions being cancelled? Please list as many details as possible about how you will complete your exercise, in the space below.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

4. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



## WILLINGNESS TO SELF-REGULATE

**INSTRUCTIONS:** Again, please think about the scenario where your regular exercise program sessions are cancelled for 2 weeks because the building had to be closed. Now, *also* imagine you have tried organizing your own exercise during that time. Unfortunately, you missed the first couple of times you planned to exercise that week.

Below is a list of reactions you might have, or actions you might take.

Please indicate, *realistically*, how likely you are to do each the following, in this situation.

For example, if it is something you would **REALISTICALLY not** do, you would circle 1 or 2; something you **might do**, circle 4-6, and something you would **definitely** do, circle 8-9.

I would.....

1. View my initial lapse during the building closure as a challenge to overcome, rather than a failure.

1	2	3	4	5	6	7	8	9
Definitely								Definitely WILL
WILL NOT								

2. Make a plan of action to resume my exercise for the remaining time the building is closed, so that I complete the regular number of sessions, at the same intensity as I do at the program sessions.

1	2	3	4	5	6	7	8	9
Definitely								Definitely WILL
WILL NOT								

3. I wouldn't think too much about missing a few days of exercise.

1	2	3	4	5	6	7	8	9
Definitely								Definitely WILL DO
WILL NOT DO								

1	2	3	4	5	6	7	8	9
Definitely WILL NOT								Definitely WILL

1	2	3	4	5	6	7	8	9
Definitely WILL NOT								Definitely WILL

1	2	3	4	5	6	7	8	9
Definitely WILL NOT DO								Definitely WILL DO

95

## WRITTEN MESSAGE MANIPULATION CHECK

**INSTRUCTIONS:** Please keep in mind the written message you read here today when answering the following questions.

Please **circle the number** that best describes your answer.

1. The written message was informative.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
<b>Strongly</b>							<b>Strongly</b>	
<b>DISAGREE</b>							<b>AGREE</b>	

2. The written message was aimed at people like me.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
<b>Strongly</b>							<b>Strongly</b>	
<b>DISAGREE</b>							<b>AGREE</b>	

3. The written message was believable.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
<b>Strongly</b>							<b>Strongly</b>	
<b>DISAGREE</b>							<b>AGREE</b>	

4. The written message was easy to read.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
<b>Strongly</b>							<b>Strongly</b>	
<b>DISAGREE</b>							<b>AGREE</b>	

5. The written message was easy to understand.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
<b>Strongly</b>							<b>Strongly</b>	
<b>DISAGREE</b>							<b>AGREE</b>	

6. The information in the written message was accurate.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
<b>Strongly</b>							<b>Strongly</b>	
<b>DISAGREE</b>							<b>AGREE</b>	

7. To what extent could you *empathize* with the *thoughts and feelings* of the person in the message?

1	2	3	4	5	6	7	8	9
very little				moderately				very much

8. To what extent could you *empathize* with the *problems and challenges* of the person in the message?

1	2	3	4	5	6	7	8	9
very little				moderately				very much

9. To what extent could you *empathize* with the *actions* of the person in the message?

1	2	3	4	5	6	7	8	9
very little				moderately				very much

*We appreciate you taking the time and effort to participate in this important research.*  
*Thank you!!*

## DEBRIEFING LETTER

Dear Saskatoon Cardiac Rehabilitation/ First Step Study Participant,

Thank you very much for participating in this research study with the University of Saskatchewan. Your assistance will help improve our understanding of the challenges you face so that we can help increase adherence to exercise in programs such as Cardiac Rehabilitation and First Step.

The purpose of the experiment “*Studying Exercise Lapses*” was to explore people’s thoughts and feelings about an exercise lapse. At the end of the study, we will provide general results and feedback to the Saskatoon Cardiac Rehabilitation and First Step programs staff. This will be in approximately 5 months. You may also contact the researchers and request a copy of the results summary.

This study has been approved on ethical grounds by the University of Saskatchewan Behavioural Research Ethics Board on May 8, 2007. Any questions regarding your rights as a participant may be addressed to either the investigators at the contact numbers below or the ethics committee through the Office of Research Services (966-2084) at the University of Saskatchewan.

Thank you for your time and support of research initiatives at the University of Saskatchewan. We will contact the winners of the gift certificates by phone once all participants have completed the study, in about 2-3 months. If you have further questions please feel free to contact Karen Glazebrook (717-8349, [karenglazebrook@gmail.com](mailto:karenglazebrook@gmail.com)) or Dr. Brawley (966-1076, [larry.brawley@usask.ca](mailto:larry.brawley@usask.ca)).

Sincerely,

Dr. Lawrence Brawley, Professor & Canada Research Chair  
Karen Glazebrook, MSc student  
College of Kinesiology  
University of Saskatchewan

*Thank you!*

## APPENDIX B

### WRITTEN MESSAGES

#### Information Control

Male Cardiac Rehabilitation  
Female First Step

#### Lapse Treatment

Female Cardiac Rehabilitation  
Male First Step

*Note: For purposes of brevity, messages are shown here differently than in the study. Written messages were presented to study participants on 8.5" x 14" paper, in 14-point font, with 1.5 times spacing. Also, in total 8 messages were used in the experiment. Not presented here are 4 messages tailored to gender. These are: Information Control- Female Cardiac Rehabilitation and Male First Step; Lapse Treatment- Male Cardiac Rehabilitation and Female First Step.*

## INFORMATION CONTROL: MALE CARDIAC REHABILITATION

Jack is 68 years old. He had a heart attack and some cardiovascular difficulties eight months ago. He has been participating in a cardiac rehabilitation exercise program for 5 months now.

Jack's cardiac rehabilitation program staff have suggested that he make a number of lifestyle changes following his heart attack, and have given him a manual with lots of information to guide him. The program staff have told Jack how important it is to do more exercise at home *in addition to* coming to the program. The program staff have suggested that he aim for 2 to 3 independent exercise sessions each week plus his regular class attendance. They also instructed him to monitor his heart rate and perceived exertion level closely and to exercise at a mild to moderate intensity. They recommend that this exercise involve both aerobic (e.g., walking, cycling) and anaerobic (e.g., weight training) activities. As well as these exercise recommendations, the cardiac rehabilitation staff have given Jack tips about following a healthy diet, checking his stress levels, avoiding smoking and second hand smoke and limiting his alcohol intake.

Regarding a healthy diet, the cardiac rehabilitation staff advised Jack on several things. They recommended that Jack limit “bad” fats from his diet, such as the animal fats found in meat and poultry. High fat diets tend to raise blood cholesterol levels. As your blood cholesterol goes up, so does your risk of a heart attack. So, staff have told Jack that he should reduce the total amount of fat that he eats every day. Some of the tips they passed along were to cut the total amount of fat he eats by using less butter, switching from 2% to 1% milk, and eating low-fat cheese. They also recommended that he try to eat more foods that are high in fibre, such as oatmeal, oat bran, whole wheat bread, and fruits and vegetables.

The cardiac rehabilitation staff have also told Jack that it is important that he monitors and controls his cholesterol levels. They gave Jack some pretty good reasons that boil down to this: Cholesterol is a group of blood fats. It includes LDL (“bad”) cholesterol and HDL (“good”) cholesterol. LDL promotes the buildup of fatty plaque inside arteries while HDL protects arteries from plaque buildup. As the plaque builds up on the blood vessels, they become clogged and the blood can't flow to the heart properly. When this happens, the chances of another heart attack increase. Cardiac rehabilitation staff emphasized that it is important that Jack asks his doctor for a blood test regularly to monitor his cholesterol levels. The goals they suggested for the results of this blood test are as follows: total cholesterol should be less than 4.0mmol/L, LDL cholesterol should be less than 2.5 mmol/L, HDL cholesterol should be greater than 1.1 mmol/L and triglycerides should be less than 2.0mmol/L.

There are some other risk factors the staff and the manual have told Jack about that are still being studied, but can be checked for in a blood test. Homocysteine is an amino acid (building block of protein) that has been linked to heart disease in some people. Those with high levels may be prescribed B-vitamins. Another risk factor, is C-Reactive protein which is a chemical marker that indicates that arteries are inflamed. Usually this is treated with aspirin. Lastly, acute infections such as the flu or lung infections may increase the chances of having a heart attack. Therefore, staff suggested to Jack that he talk to his doctor about getting a flu shot every year.

The program staff have also provided education about salt intake. They said that Jack should try to cut back on salt because it causes the body to hold on to more fluids.

Most North Americans eat 10-20 times more salt than they need. The staff explained that you should not eat more than 2400 mg of salt each day. They explained that the added fluid makes your heart work harder. To reduce the salt he eats, cardiac rehabilitation staff recommended that Jack should try to use less or no salt in cooking, avoid salty snack foods like potato chips and nuts, and try to use pepper and spices instead of salt to flavour his meals.

Jack learned about reading nutrition labels to help him choose healthier foods, and compare similar foods. Some food labels make claims such as “low fat”, or “high source of dietary fibre”. In order to make these claims, the product must meet government regulations. Besides these claims, there is an information box on food packaging labeled “nutrition facts” that gives important information about calorie content and 13 different nutrients. The staff suggested to Jack that he read these labels, by first looking at the size of the serving to which the nutrition facts information applies. Next, they instructed that Jack look at how many grams or milligrams of each nutrient that is in the product serving, as well as the percent of daily value that you should get from that nutrient. By considering these steps Jack can judge if the value is a lot or a little.

Dietary fibre is one nutrient Jack was told to look for by staff. Getting lots of fibre is an important part of eating well for your heart. Dietary fibre has two types: soluble and insoluble. Soluble fibre helps lower cholesterol levels; insoluble fibre does not but is still healthy. Jack found out from staff that he should aim for 25-35 grams of fibre each day, which includes 5-10 grams of soluble fibre, along with 6-8 cups of fluid each day.

When picking margarine products, the staff tell Jack to watch for some specific things. The label should say ‘non-hydrogenated’, and should have 6 grams or *more* of total polyunsaturates and monounsaturates for a 2 teaspoon serving. Hydrogenation, Jack learns, is the manufacturing process that turns liquid fats into solid fats. This process produces trans fatty acids, which act like saturated fats (bad fats) lowering good cholesterol (HDL) and raising bad cholesterol (LDL). Trans fatty acids are found in hydrogenated vegetable oils and margarines, shortening, commercial cakes, pies and cookies, candies, chips and other snack foods.

The staff have also provided Jack with some general tips to help with weight control. They tell him to write out a shopping list before he goes to the supermarket, and stick to that list. Also, they suggested he avoid shopping at the supermarket when he is hungry. They stressed the importance of Jack eating regular meals, and especially a good breakfast. Other suggestions that they offered Jack were about eating. For example, they said that Jack should concentrate on chewing food slowly, and only preparing the amount of food that he needs rather than large portions. Furthermore, they gave tips such as Jack asking for a take-home doggy bag for leftovers at restaurants.

Beyond a healthy diet, the cardiac rehabilitation program staff also want Jack to monitor his stress levels. Stress, as Jack’s manual explains, has physical and emotional signs. Physical changes during stress include a racing and pounding heart, sweating, tight feeling in the stomach, tense muscles, clenched jaw and heightened senses. Emotional signs of stress include racing thoughts, compelling emotions, irrational anger, worry and anxiety. High stress can contribute to high cholesterol levels, high blood pressure, and cause blood clotting abnormalities. Although stress can’t always be eliminated, staff want Jack to try to manage it by using relaxation techniques, getting support from family and friends and trying to modify stressful situations.



Cardiac rehabilitation staff have also told Jack about other situations he might consider avoiding. One is avoiding exposure to second-hand smoke. Since having his heart attack, Jack is trying to avoid second-hand smoke because smoking (or exposure to second-hand smoke) makes his heart work harder and decreases the oxygen carried in his blood. Second hand smoke is a toxic substance, containing over 50 cancer-causing chemicals. The manual explains a lot of facts about smoking that Jack didn't know. The nicotine in cigarettes causes blood pressure and heart rate to increase, making the heart work harder. It also lowers HDL (good) cholesterol. Smoking also speeds up the rate that cholesterol builds up in arteries.

Drinking alcohol only in moderation is another thing the program staff have made Jack aware of. This is important because alcohol can affect how Jack's medications work, and alcohol can also raise triglyceride levels. A sensible guide for alcohol intake for men is 2 drinks per day.

## INFORMATION CONTROL: FEMALE FIRST STEP

Mary is 57 years old. Her doctor told her six months ago that she has risk factors for heart disease and needs to lose some weight. Her doctor says she should modify her lifestyle to help prevent future health problems. Mary has been participating in the First step exercise program for 5 months now.

Mary's First Step program staff have suggested that she make a number of lifestyle changes, and have led education classes to guide her. The program staff have told Mary how important it is to do more exercise at home *in addition to* coming to the program. The program staff have suggested that she aim for 2 to 3 independent exercise sessions each week plus her regular class attendance. They also instructed her to monitor her heart rate and perceived exertion level closely and to exercise at a mild to moderate intensity. They recommend that this exercise involve both aerobic (e.g., walking, cycling), resistance exercise, and stretching exercise. As well as these exercise recommendations, the First step staff have given Mary tips about following a healthy diet, monitoring glucose, checking her stress levels, avoiding smoking and second hand smoke and limiting her alcohol intake.

Regarding a healthy diet, the First Step staff advised Mary on several things. They recommended that Mary limit “bad” fats from her diet, such as the animal fats found in meat and poultry. High fat diets tend to raise blood cholesterol levels. As your blood cholesterol goes up, so does your risk of heart disease. So, staff have told Mary that she should reduce the total amount of fat that she eats every day. Some of the tips they passed along were to cut the total amount of fat she eats by using less butter, switching from 2% to 1% milk, and eating low-fat cheese. They also recommended that she try to eat more foods that are high in fibre, such as oatmeal, oat bran, whole wheat bread, and fruits and vegetables.

The First Step staff have also told Mary that it is important that she monitors and controls her cholesterol levels. They gave Mary some pretty good reasons that boil down to this: Cholesterol is a group of blood fats. It includes LDL (“bad”) cholesterol and HDL (“good”) cholesterol. LDL promotes the buildup of fatty plaque inside arteries while HDL protects arteries from plaque buildup. As the plaque builds up on the blood vessels, they become clogged and the blood can’t flow to the heart properly. First Step staff emphasized that it is important that Mary asks her doctor for a blood test regularly to monitor her cholesterol levels. The goals they suggested for the results of this blood test are as follows: total cholesterol should be less than 4.0mmol/L, LDL cholesterol should be less than 2.5 mmol/L, HDL cholesterol should be greater than 1.1 mmol/L. and triglycerides should be less than 2.0mmol/L.

The staff have also told Mary about other risk factors that she should be aware of. Impaired fasting glucose and impaired glucose tolerance are conditions related to the development of heart disease and Type 2 Diabetes. Because Mary has increased body weight and other risk factors, she needs to be aware of these conditions so she can monitor her health. Regular exercise may help control the blood sugars associated impaired glucose tolerance, and also help control her weight. Other tips Mary learned for controlling her blood glucose include eating a good breakfast, including high-fibre foods in her diet, adding more fruits and vegetables to her diet and choosing low- sugar foods.

The program staff have also provided education about salt intake. They said that Mary should try to cut back on salt because it causes the body to hold on to more fluids. Most North Americans eat 10-20 times more salt than they need. The staff explained that you should not

eat more than 2400 mg of salt each day. They explained that the added fluid makes your heart work harder. To reduce the salt she eats, First Step staff recommended that Mary should try to use less or no salt in cooking, avoid salty snack foods like potato chips and nuts, and try to use pepper and spices instead of salt to flavour her meals.

Mary learned about reading nutrition labels to help her choose healthier foods, and compare similar foods. Some food labels make claims such as “low fat”, or “high source of dietary fibre”. In order to make these claims, the product must meet government regulations. Besides these claims, there is an information box on food packaging labeled “nutrition facts” that gives important information about calorie content and 13 different nutrients. The staff suggested to Mary that she read these labels, by first looking at the size of the serving to which the nutrition facts information applies. Next, they instructed that Mary look at how many grams or milligrams of each nutrient that is in the product serving, as well as the percent of daily value that you should get from that nutrient. By considering these steps Mary can judge if the value is a lot or a little.

Dietary fibre is one nutrient Mary was told to look for by staff. Getting lots of fibre is an important part of eating well for your heart, and for controlling blood sugar. Dietary fibre has two types: soluble and insoluble. Soluble fibre helps lower cholesterol levels; insoluble fibre does not but is still healthy. Mary found out from staff that she should aim for 25-35 grams of fibre each day, which includes 5-10 grams of soluble fibre, along with 6-8 cups of fluid each day.

When picking margarine products, the staff tell Mary to watch for some specific things. The label should say ‘non-hydrogenated’, and should have 6 grams or *more* of total polyunsaturates and monounsaturates for a 2 teaspoon serving. Hydrogenation, Mary learns, is the manufacturing process that turns liquid fats into solid fats. This process produces trans fatty acids, which act like saturated fats (bad fats) lowering good cholesterol (HDL) and raising bad cholesterol (LDL). Trans fatty acids are found in hydrogenated vegetable oils and margarines, shortening, commercial cakes, pies and cookies, candies, chips and other snack foods.

The staff have also provided Mary with some general tips to help with weight control. They tell her to write out a shopping list before she goes to the supermarket, and stick to that list. Also, they suggested she avoid shopping at the supermarket when she is hungry. They stressed the importance of Mary eating regular meals, and especially a good breakfast. Other suggestions that they offered Mary were about eating. For example, they said that Mary should concentrate on chewing food slowly, and only preparing the amount of food that she needs rather than large portions. Furthermore, they gave tips such as Mary asking for a take-home doggy bag for leftovers at restaurants.

Beyond a healthy diet, the First Step program staff also want Mary to monitor her stress levels. Stress, as Mary’s learns, has physical and emotional signs. Physical changes during stress include a racing and pounding heart, sweating, tight feeling in the stomach, tense muscles, clenched jaw and heightened senses. Emotional signs of stress include racing thoughts, compelling emotions, irrational anger, worry, and anxiety. High stress can contribute to high cholesterol levels, and high blood pressure. Although stress can’t always be eliminated, staff want Mary to try to manage it by using relaxation techniques, getting support from family and friends and trying to modify stressful situations.

First Step staff have also told Mary about other situations she might consider avoiding. One is avoiding exposure to second-hand smoke. Second hand smoke is a toxic substance,

containing over 50 cancer-causing chemicals. The nicotine in cigarettes lowers HDL (good) cholesterol and speeds up the rate that cholesterol builds up in arteries.

Drinking alcohol only in moderation is another thing the program staff have made Mary aware of. This is important because alcohol can affect how Mary's medications work, and alcohol can also raise triglyceride levels. A sensible guide for alcohol intake for women is 1 drink per day.

## LAPSE TREATMENT: FEMALE CARDIAC REHABILITATION

Mary is 68 years old. She had a heart attack and some cardiovascular difficulties eight months ago. She has been participating in a cardiac rehabilitation exercise program for 5 months now.

Mary tries to attend all of the cardiac rehabilitation exercise sessions on a regular basis. The program staff told her how important it is to do exercise at home *in addition* to coming to the program. They also told Mary to exercise on her own when she can't make it to a regular cardiac rehabilitation session for any reason.

Attending her regular exercise at the program is important to Mary because it makes her feel like she is taking responsibility for her own health. As a result, she sometimes tries to do walking at home although she finds this more difficult than attending the program.

One day just before leaving to attend her exercise program to walk on the track, Mary gets a phone call. Her good friend asks her to meet her for coffee, but says she can only go this morning. Mary is hesitant, but decides to meet her friend because they don't often see each other and she doesn't want to disappoint her friend. Mary tells herself she will go walking later at home to make up the missed session. After lunch, when Mary gets home she is tired and also had planned to do some things around the house. She decides that she will make up the exercise tomorrow.

The next day when she gets up in the morning, Mary isn't feeling 100 percent. She isn't sure if this just an off day, so decides to see if she will feel better as the day goes on. The feeling improves slightly but to be sure she is well she decides to relax. However, Mary feels guilty about skipping her last exercise program session and her planned make up walk. Her husband, knowing that she missed both, asks her why she doesn't go for a walk today. Mary replies "Don't worry, I have the regular session at the centre tomorrow". But her husband points out that she has forgotten that she won't be going because they are having people over tomorrow for brunch, and some are driving a distance to visit. Tomorrow, he says, was the original exercise program day she planned to skip.

Mary realizes that she will have to walk very early tomorrow to make up a session and stay on track. She doesn't really like doing her exercise in the early morning, and she will have to rush the walk just to get it in. She also remembers that after the brunch, they are driving out of town to visit family for the weekend. Mary realizes it's the early morning walk or nothing. She feels frustrated and guilty with herself and the circumstances. She isn't looking forward to the early session, and has a little anxiety about already missing some exercise because she knows how important the exercise is for her health. She decides to set the alarm early just to be sure she follows through with her plan. Later that night after doing some reading, she feels pretty tired. She heads to bed and forgets to reset the alarm.

In the morning, to her surprise, Mary rises at her normal time, but late for her make-up walk. She silently grumbles at herself about forgetting the alarm and starts the day shaking her head about her forgetfulness and missing another planned walk. She started considering a walk between brunch and their drive to go out of town but as the brunch preparations, visiting and clean up quickly showed her, the walk was not an option. The brunch ran late and a few errands and packing for the weekend came right on the heels of their friends' departure. The day seems like it has flashed by and Mary and her husband need to get on the road so they can make it to their family dinner.

While they are driving, Mary reflects on the fact that she hasn't exercised all week. She feels sluggish and really guilty about not going to the cardiac rehabilitation program. She recalls that she was getting feedback at the program about how well she was doing. "What will they think now?" Mary wonders.

She thinks about the past week and is angry with herself for missing all the opportunities she'd planned for exercise. "If only I had planned better", she mutters. "The staff said I should exercise at home, but I didn't think too much about it because it seemed easy. What is wrong with me? I used to be pretty organized."

The visit with their family is a welcome relief from the nagging worry. They fully enjoy their visit and it seems all too short. Mary and her husband are reluctant to leave the good meals and the excitement. They drive home late, happy after a good dinner but tired from the full weekend. They fall into bed to a welcome sleep.

Mary rises Monday morning feeling like more sleep would be great. Still remembering the weekend, she smiles and settles down in her armchair to read her book and nods off. Her husband also wakes late and shakes her awake. "You're late for the program at the centre!", he says with concern. Mary bolts out of the chair, anxiety quickly rising. "Shoot!" she gasps, looking at her watch. She considers her drive and quickly concludes that it's not worth it to attend. She can't believe she dozed through a good start to this new week. "What is the matter with me?" Frustrated, she grabs her windbreaker, ties her shoes, and exclaims, "I'll walk right now!!" She sets off at a brisk pace, charging down the street, still angry with herself. After a couple of blocks at a very fast pace, she is breathing deeply and can feel her heart pounding away. She pushes herself to keep going determined to make up another miss. After another couple of blocks, she is almost gasping, and needs to slow down. She has forgotten the way she exercises at the centre and what staff have told her about exercise. She slows down a bit and pauses at a corner thinking, "This was dumb – too fast, too fast". She waits there longer, worried that she pushed too hard and thinks about her heart. When she recovers her breath, she realizes that she has done everything wrong in reacting this way. She even realizes that she didn't have a walking route or distance planned. "I'm so foolish!", she thinks, shaking her head. She slowly returns home, worrying that she may have over done it.

At home, she slumps in her chair, thinking that her ability to get back at exercise isn't very good. "I've missed a lot", she thinks. The anxious feeling won't leave her. Mary wonders if she's kidding herself about exercise. She is worried that the walking she normally does is going to be really hard if she goes back. She thinks about how she hasn't done a good job the last week and worries, "What will happen to me and my health if I miss any more exercise?" All day these thoughts seem to pop up without warning. They keep going through her mind, making her anxious and unsettled. "Why didn't I get my exercise done? Why didn't I get up earlier and go?" She also wonders, "How is this affecting my health? Even if I start exercising again, what damage have I already done?"

Mary seems out of sorts and a little blue to her husband, but he decides not to bring it up. For the next three days, Mary busies herself with odd jobs around the house, working on unfinished projects and starting new ones. Mary's husband notices that she seems most busy and preoccupied the mornings that she would normally go to cardiac rehabilitation. On Friday morning, she seems more chipper until he volunteers to drive her to the track. Her curt reply is that she has too many things to do, no thanks. "Why did he have to bring that up?", Mary thinks, "I was in a good mood".

Mary feels guilty almost immediately and knows that she really should return to the cardiac rehabilitation program. Logically, she knows going back to exercise at the centre is what she should do but she wants to avoid all the unpleasant feelings and frustration with herself.

All week long she has been focused on her heart and breathing, wondering if she was going to have symptoms of an attack when doing work. Mary has a lot of doubt at the moments when she is even slightly out of breath, even though these moments are normal. She feels like she is wrestling with herself at moments when she thinks about the need to return. When she thinks this way, she tries to avoid that uncomfortable feeling by getting involved in odd jobs. Knowing that the time for a medical checkup is soon only contributes to her worry. It has been two weeks now that Mary has been away from the program. She knows she is spinning her wheels and has to make a decision soon. The feeling of urgency sticks to her.....

## LAPSE TREATMENT: MALE FIRST STEP

Jack is 57 years old. His doctor told him six months ago that he has risk factors for heart disease and needs to lose some weight. His doctor says he should modify his lifestyle to help prevent future health problems. Jack has been participating in the First Step exercise program for 5 months now.

Jack tries to attend all of the First Step exercise sessions on a regular basis. The program staff told him how important it is to do exercise at home *in addition* to coming to the program. They also told Jack to exercise on his own when he can't make it to a regular session for any reason.

Attending his regular exercise at the program is important to Jack because it makes him feel like he is taking responsibility for his own health. As a result, he sometimes tries to do walking at home although he finds this more difficult than attending the program.

One day just before leaving to attend his exercise program to walk on the track, Jack gets a phone call. His good friend asks him to meet him for coffee, but says he can only go this morning. Jack is hesitant, but decides to meet his friend because they don't often see each other and he doesn't want to disappoint his friend. Jack tells himself he will go walking later at home to make up the missed session. After lunch, when Jack gets home he is tired and also had planned to do some things around the house. He decides that he will make up the exercise tomorrow.

The next day when he gets up in the morning, Jack isn't feeling 100 percent. He isn't sure if this just an off day, so decides to see if he will feel better as the day goes on. The feeling improves slightly but to be sure he is well he decides to relax. However, Jack feels guilty about skipping his last exercise program session and his planned make up walk. His wife, knowing that he missed both, asks him why he doesn't go for a walk today. Jack replies "Don't worry, I have the regular session at the Field House tomorrow". But his wife points out that he has forgotten that he won't be going because they are having people over tomorrow for brunch, and some are driving a distance to visit. Tomorrow, she says, was the original exercise program day he planned to skip.

Jack realizes that he will have to walk very early tomorrow to make up a session and stay on track. He doesn't really like doing his exercise in the early morning, and he will have to rush the walk just to get it in. He also remembers that after the brunch, they are driving out of town to visit family for the weekend. Jack realizes it's the early morning walk or nothing. He feels frustrated and guilty with himself and the circumstances. He isn't looking forward to the early session, and has a little anxiety about already missing some exercise because he knows how important the exercise is for his health. He decides to set the alarm early just to be sure he follows through with his plan. Later that night after watching TV, he feels pretty tired. He heads to bed and forgets to reset the alarm.

In the morning, to his surprise, Jack rises at his normal time, but late for his make-up walk. He silently grumbles at himself about forgetting the alarm and starts the day shaking his head about his forgetfulness and missing another planned walk. He started considering a walk between brunch and their drive to go out of town but as the brunch preparations, visiting and clean up quickly showed him, the walk was not an option. The brunch ran late and a few errands and packing for the weekend came right on the heels of their friends' departure. The day seems like it has flashed by and Jack and his wife need to get on the road so they can make it to their family dinner.



While they are driving, Jack reflects on the fact that he hasn't exercised all week. He feels sluggish and really guilty about not going to the First Step program. He recalls that he was getting feedback at the program about how well he was doing. "What will they think now?" Jack wonders.

He thinks about the past week and is angry with himself for missing all the opportunities he'd planned for exercise. "If only I had planned better", he mutters. "The staff said I should exercise at home, but I didn't think too much about it because it seemed easy. What is wrong with me? I used to be pretty organized."

The visit with their family is a welcome relief from the nagging worry. They fully enjoy their visit and it seems all too short. Jack and his wife are reluctant to leave the good meals and the excitement. They drive home late, happy after a good dinner but tired from the full weekend. They fall into bed to a welcome sleep.

Jack rises Monday morning feeling like more sleep would be great. Still remembering the weekend, he smiles and settles down in his armchair with a cup of coffee to read the paper and nods off. His wife also wakes late and shakes him awake. "You're late for the program at the Field House!", she says with concern. Jack wrestles himself out of the chair, anxiety quickly rising. "Darn!" he gasps, looking at his watch, "Darn it!" He considers his drive and quickly concludes that it's not worth it to attend. He can't believe he dozed through a good start to this new week. "What is the matter with me?" Frustrated, he grabs his windbreaker, ties his shoes, and exclaims, "I'll walk right now!!" He sets off at a brisk pace, charging down the street, still angry with himself. After a couple of blocks at a very fast pace, he is breathing deeply and can feel his heart pounding away. He pushes himself to keep going determined to make up another miss. After another couple of blocks, he is almost gasping, and needs to slow down. He has forgotten the way he exercises at the Field House and what staff have told him about exercise. He slows down a bit and pauses at a corner thinking, "This was dumb – too fast, too fast". He waits there longer, worried that he pushed too hard and thinks about his heart. When he recovers his breath, he realizes that he has done everything wrong in reacting this way. He even realizes that he didn't have a walking route or distance planned. "Darn fool", he thinks, shaking his head. He slowly returns home, worrying that he may have over done it.

At home, he slumps in his chair, thinking that his ability to get back at exercise isn't very good. "I've missed a lot", he thinks. The anxious feeling won't leave him. Jack wonders if he's kidding himself about exercise. He is worried that the walking he normally does is going to be really hard if he goes back. He thinks about how he hasn't done a good job the last week and worries, "What will happen to me and my health if I miss any more exercise?" All day these thoughts seem to pop up without warning. They keep going through his mind, making him anxious and unsettled. "Why didn't I get my exercise done? Why didn't I get up earlier and go?" He also wonders, "How is this affecting my health? Even if I start exercising again, what damage have I already done?"

Jack seems out of sorts and a little blue to his wife, but she decides not to bring it up. For the next three days, Jack busies himself with odd jobs about the house, looking for things to complete or change. Jack's wife notices that he seems most busy and preoccupied the mornings that he would normally go to First Step. On Friday morning, he seems more chipper until she volunteers to drive him to the track. His curt reply is that he has too many things to do, no thanks. "Why did she have to bring that up?", Jack thinks, "I was in a good mood".

Jack feels guilty almost immediately and knows that he really should return to the First Step program. Logically, he knows going back to exercise at the Field House is what he should do but he wants to avoid all the unpleasant feelings and frustration with himself.

All week long Jack feels like he is wrestling with himself at moments when he thinks about the need to return. When he thinks this way, he tries to avoid that uncomfortable feeling by getting involved in odd jobs. Knowing that the time for a medical checkup is soon only contributes to his worry. It has been two weeks now that Jack has been away from the program. He knows he is spinning his wheels and has to make a decision soon. The feeling of urgency sticks to him.....

## APPENDIX C

### Participant Demographics: Cardiac Rehabilitation and First Step

Table C1

*Participant Demographics: Cardiac Rehabilitation and First Step*

Demographic		Cardiac <i>n</i> = 32	First Step <i>n</i> = 12
Months in program: mean (SD)		15.1 (17.6)	17.3 (33.1)
Age (years): mean (SD)		62.7 (7.2)	60.1 (12.7)
Gender (%):	Male	68.8*	25.0*
	Female	31.2*	75.0*
Marital status (%):	Married	78.1	66.7
	Divorced	6.2	8.3
	Separated	3.1	8.3
	Single	3.1	16.7
	Widowed	9.4	0
Employment (%):	Retired	68.8	58.3
	Employed	18.8	16.7
	Homemaker	6.2	8.3
	Other	6.2	16.7
Smoking history (%):	Never	37.5	45.5
	Past	56.2	54.5
	Current	6.2	0
# of co-morbidities: mean (SD)		3.3 (1.9)	3.1 (1.2)
Exercise: mean days/week (SD)	Program	2.9 (.53)*	2.5 (.52)*
	Independent	1.1 (1.1)**	2.5 (1.8)**
	Total	4.0 (1.4)	4.9 (2.0)
Previously exercised consistently (%):	Yes	9.0	25.0
	No	91.0	75.0
Missed 2 consecutive weeks (%):	Yes	53.1	46.9
	No	58.3	41.7
Exercise important to health: mean (SD)		8.0 (1.8)	8.2 (1.3)

*Note.* Participants rated the degree to which they felt exercising regularly was important to their health on a scale of 1 (*strongly disagree*) to 9 (*strongly agree*). Statistical comparisons between Cardiac and First Step participants were all nonsignificant, excluding gender and frequency of program and independent exercise. Total frequency of exercise was not significantly different.

\*  $p < .05$ . \*\*  $p < .01$

## APPENDIX D

### DEMOGRAPHICS

Demographic Characteristics of All Participants and Randomized Groups

Medical Conditions Reported by All Participants

Table D1

*Demographic Characteristics of All Participants and Randomized Groups*

Demographic		All N = 44	Information n = 22	Lapse n = 22
Exercise Program (%):	Cardiac	72.7	72.7	72.7
	First Step	27.3	27.3	27.3
Months in program: mean (SD)		15.7 (22.7)	15.9 (25.2)	15.5 (20.5)
Age (years): mean (SD)		62.2 (8.8)	61.9 (9.0)	62.5 (8.9)
Gender (%):	Male	56.8	59	54.5
	Female	43.2	54.5	45.5
Marital status (%):	Married	75	77.3	72.7
	Divorced	6.8	9.1	4.5
	Separated	4.5	0	9.1
	Single	6.8	9.1	4.5
	Widowed	6.8	4.5	9.1
Employment (%):	Retired	65.9	63.6	68.2
	Employed	18.2	22.7	13.6
	Homemaker	6.8	4.5	9.1
	Other	9.1	9.1	9.1
Smoking history (%):	Never	39.5	36.4	40.9
	Past	55.8	54.5	54.5
	Current	4.7	9.1	0
# of co-morbidities: mean (SD)		3.3 (1.7)	3.4 (1.8)	3.2 (1.6)
Exercise: mean days/week (SD)	Program	2.8 (.55)	2.6 (.50)*	3.0 (.54)*
	Independent	1.5 (1.4)	1.3 (1.4)	1.7 (1.5)
	Total	4.3 (1.6)	3.9 (1.5)	4.7 (1.7)
Previously exercised consistently (%):	Yes	13.6	13.6	13.6
	No	86.4	86.4	86.4
Missed 2 consecutive weeks (%):	Yes	50.0	45.4	54.5
	No	50.0	54.5	45.4
Exercise important to health: mean (SD)		8.1 (1.6)	8.0 (1.9)	8.1 (1.3)

*Note.* Participants rated the degree to which they felt exercising regularly was important to their health on a scale of 1 (*strongly disagree*) to 9 (*strongly agree*). Statistical comparisons between randomized groups were all nonsignificant, excluding frequency of program exercise.

\*  $p < .05$ .

Table D2

*Medical Conditions Reported by All Participants*

Medical Condition	Percent
Myocardial infarction	20.5
Angina	25.0
Bypass surgery	22.7
Angioplasty	38.6
Arthritis	25.0
Asthma	9.1
High blood pressure	61.4
Diabetes	18.2
Pre-diabetes	13.6
Overweight	40.9
High cholesterol	31.8
Stomach problems	13.6
Cancer	2.3

*Note.*  $N = 44$  for all participants. Chi-square comparisons of participants in the information control group and lapse treatment group revealed no significant differences in reported medical conditions.

## APPENDIX E

### Principal Component Factor Analysis: Willingness to Self-Regulate Scale



## Factor Analysis: Willingness to Self-regulate (6-item Index)

### Communalities

	Initial	Extraction
action_likely_1	1.000	.518
action_likely_2	1.000	.677
action_likely_3_reverse	1.000	.287
action_likely_4	1.000	.667
action_likely_5	1.000	.657
action_likely_6_reverse	1.000	.698

Extraction Method: Principal Component Analysis.

### Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.156	35.933	35.933	2.156	35.933	35.933	2.005	33.417	33.417
2	1.349	22.480	58.413	1.349	22.480	58.413	1.500	24.997	58.413
3	.959	15.985	74.398						
4	.647	10.786	85.185						
5	.508	8.467	93.652						
6	.381	6.348	100.000						

Extraction Method: Principal Component Analysis.

### Component Matrix(a)

	Component	
	1	2
action_likely_2	.801	-.190
action_likely_6_reverse	.732	-.403
action_likely_1	.715	-.087
action_likely_5	.409	.700
action_likely_4	.508	.640
action_likely_3_reverse	.208	-.493

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

**Rotated Component Matrix(a)**

	Component	
	1	2
action_likely_6_reverse	.834	-.047
action_likely_2	.804	.175
action_likely_1	.682	.231
action_likely_3_reverse	.401	-.355
action_likely_5	.066	.808
action_likely_4	.181	.797

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 a. Rotation converged in 3 iterations.

**Component Transformation Matrix**

Component	1	2
1	.902	.432
2	-.432	.902

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.

**Component Score Coefficient Matrix**

	Component	
	1	2
action_likely_1	.327	.085
action_likely_2	.396	.034
action_likely_3_reverse	.245	-.288
action_likely_4	.007	.530
action_likely_5	-.054	.550
action_likely_6_reverse	.435	-.123

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 Component Scores.

**Component Score Covariance Matrix**

Component	1	2
1	1.000	.000
2	.000	1.000

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 Component Scores.

## APPENDIX F

### Bivariate Correlations between Study Variables

Table F1

*Bivariate Correlations between Study Variables*

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. EMSE	--											
2. Time 1 SRE	.385**	--										
3. Pos. affect	.045	.344*	--									
4. Neg. affect	.402**	-.310*	.057	--								
5. Thought score	.134	.517**	.328*	-.059	--							
6. Dec. struggle	-.320*	-.701**	-.356*	.283	-.400**	--						
7. Time 2 SRE	.453**	.710**	.320*	-.264	.465**	-.487**	--					
8. N Specific steps	-.061	.141	.071	.183	-.029	.200	.231	--				
9. Will-3 items	.268	.386**	.085	-.116	.372*	-.248	.560**	.235	--			
10. Will-alternative	.179	.149	.290	-.004	.150	-.193	.125	-.020	.226	--		
11. Will-support	-.052	.213	.449**	.187	.099	-.317*	.037	-.017	.133	.450**	--	
12. SRE change	.155	-.102	.091	-.035	.067	.107	.610**	.176	.313*	.007	-.230	--

Note. \*  $p < .05$ . \*\*  $p < .01$

## APPENDIX G

### Univariate $F$ Tests on Experimental Study Variables and Hypothesized Direction

Table G1

*Univariate F-Tests on Experimental Study Variables and Hypothesized Direction*

	Adj. information means	Adj. lapse means	SE	F	p	Means in hypothesized direction?
Positive affect	34.8	35.5	1.3	0.13	0.72	No
Negative affect	14.2	17.0	1.3	2.4	0.13	Yes
Thoughts score	0.8	0.6	0.45	0.05	0.83	Yes
Decisional struggle	2.5	3.0	0.39	0.67	0.42	Yes
Exercise SRE	72.0	66.6	0.58	0.47	0.49	Yes
N Specific plans	1.9	2.1	0.54	0.23	0.63	No
Willing 3-items	6.3	6.3	5.5	0.04	0.85	No
Willing-alternative	3.5	4.9	0.59	2.6	0.11	No
Willing-support	5.2	5.0	0.33	0.05	0.81	Yes

*Note.*  $N = 44$  for the entire sample ( $n = 22$  in each of the information control and lapse treatment groups). Degrees of freedom for all F-tests = (1, 42). Information = Information control group, Lapse = Lapse treatment group. Affect was out of a possible total of 50 for each positive and negative. Thoughts score was calculated by (N positive – N negative), therefore lower scores are more negative. Decisional struggle was rated on 1 (*no struggle*) to 9 (*tremendous struggle*). Exercise SRE was rated on 0% (*not at all confident*) to 100% (*completely confident*). Higher number of specific plans was considered better. Willingness scales were rated on 1 (*definitely will not*) to 9 (*definitely will*). SE = standard error.

## APPENDIX H

### Demographic Characteristics of Groups of Positive and Negative Thinkers

Table H1

*Demographic Characteristics of Groups of Positive and Negative Thinkers*

Demographic		Positive <i>n</i> = 29	Negative <i>n</i> = 11
Exercise program (%):	Cardiac	75.9	72.7
	First Step	24.1	27.3
Months in program: mean (SD)		19.3 (27.2)	8.7 (4.8)
Age (years): mean (SD)		62.4 (9.3)	61.8 (8.6)
Gender (%):	Male	55.2	54.5
	Female	44.8	45.5
Marital status (%):	Married	79.3	54.5
	Divorced	6.9	9.1
	Separated	3.4	9.1
	Single	3.4	18.2
	Widowed	6.9	9.1
Employment (%):	Retired	65.5	24.2
	Employed	17.2	9.1
	Homemaker	10.3	0
	Other	6.9	18.2
Smoking history (%):	Never	41.4	45.5
	Past	51.7	45.5
	Current	3.4	9.1
# of co-morbidities: mean (SD)		3.2 (1.8)	3.0 (1.5)
Previously exercised consistently (%):	Yes	17.2	9.1
	No	82.8	90.9
Missed 2 consecutive weeks (%):	Yes	48.3	63.6
	No	51.7	36.4
Exercise important to health: mean (SD)		8.3 (1.6)	7.6 (1.6)

*Note.* Participants rated the degree to which they felt exercising regularly was important to their health on a scale of 1 (*strongly disagree*) to 9 (*strongly agree*). Statistical comparisons on demographic variables between groups of positive and negative thinkers were all nonsignificant.



## APPENDIX I

### Positive and Negative Thinkers Compared on Emotional Self-Efficacy

Table I1

*Positive and Negative Thinkers Compared on Emotional Self-Efficacy*

	<i>M</i>	<i>SD</i>	<i>F</i>	<i>df</i>	<i>p</i>
Positive thinkers	72.7	22.5	0.596	1, 38	0.445
Negative thinkers	66.3	26.7			

*Note.* EMSE was rated on a scale of 0% (*not at all confident*) to 100% (*completely confident*). *n* = 29 for positive thinkers, *n* = 11 for negative thinkers.